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BASIC ACCIDENT CONTROL FOR SUPERVISORS

Alberta

WORKERS' HEALTH SAFETY
AND COMPENSATION
Occupational Health and Safety Division

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BASIC ACCIDENT CONTROL

COURSE

FOR SUPERVISORS

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INTRODUCTION

The purpose of this course is to create an awareness of the hazards that exist or may exist in a particular work situation or process; and to give the supervisor some tools and methods to control or eliminate the hazards.

The term "accident" is used in a broad sense -- an unplanned event that caused, or could have caused, damage or injury or interruption of the job. It is invariably preceded by deficiencies in either the performance of or control of the work activity - reflecting the failings in skills or attitudes of those who work in the area; managers, operators, skilled workers.

In today's complicated and sophisticated work system, accident control requires the understanding and attention of supervisory staff and the co-operation of all personnel involved in the work process. Particularly, a greater effort has to be expended toward increasing the safety awareness of the worker. After all, a great many accidents, such as falling from ladders, operating machines without guards, dropping objects on toes, or cutting hands by misusing tools, are the direct results of the acts of a worker and not the hazardous conditions that may be in the environment.

These acts are seldom a deliberate intent to be unsafe - they result from a lack of instruction or application of safe practices, or a lack of understanding in the need to use safe work practices. Only by involving the worker in discussion and instruction can safety awareness be created. Safety must be put on a personal basis. Therefore, supervisors, not safety men, are in a better position to do something about accidents.

The supervisor is the only person who controls men, machines, and working conditions on a daily full time basis. Not surprisingly, therefore, where safety has been given a high priority among management activities, and supervisors have fully discharged their responsibilities for safety, the accident control activity has been an outstanding success.

On the course, supervisors will learn what these responsibilities are, and how they may be met.

ROLE OF THE SUPERVISOR

By giving the impression that the total job belongs to him, the supervisor takes the blame for all production problems: He gave the wrong order, forgot to give an order, failed to enforce, failed the check, etc. However, production is the job of the workers who should respond to anything which threatens to interfere with their production. Supervisors believe they direct and control workers, organize materials and maintain equipment to meet the goals of their operations.

Once the supervisor understands the importance of the functions of management and how they are implemented, he then must ask himself three important questions.

a) What are my responsibilities as a supervisor?
b) With whom do I spend my time during the day?
c) What activities do I spend my time on?

Consider the following statements before answering the questions. When you have a supervisor checking on the job; he's not a supervisor, he's a checker. You have a manager checking the supervisor; he is not a manager, he's a checker. What happens in the typical company, is that people are overchecked and under-managed. When this happens, two people are doing the same job and neither takes responsibility. What we get is the ludicrous situation of bawling out the supervisor for the mistake of a subordinate.

If you take a hard look at the position of supervisors in terms of what they do rather than in terms of their job descriptions, you would find that they are not supervisors - they are checkers. Is the above statement true for you? Let us take a look at answers to the three questions on responsibilities, time and activities of a supervisor.

With whom does the supervisor spend his time?

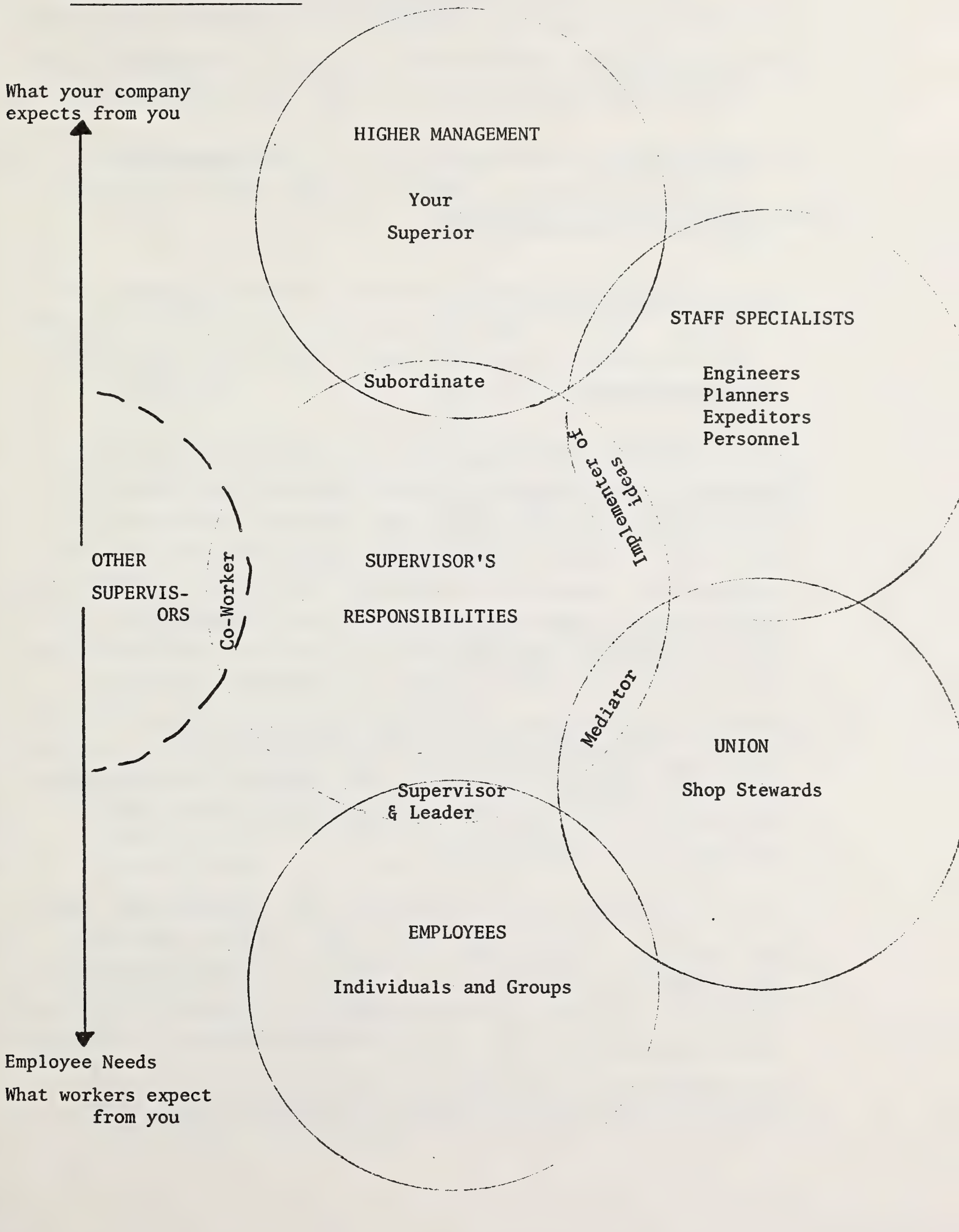
Time Spent	Percent
Alone	33
With own workers	30
With other supervisors	8
With superiors	7
With maintenance and service personnel	6
With others	16

What kind of activities does a supervisor spend his time on?

Personal Activities	Percent
Talking	43
Looking	18
Handling, manipulating	12
Writing	7
Walking	6
Showing	3
Listening	2
Reading	2
Sitting	1
Standing	1
Miscellaneous	5
	100

Too often, the supervisor sees himself only as a middleman put in an awkward position to serve as a buffer between the company and the workers. A supervisor, in a well managed organization, is much more than just a middleman. He is really the key man. Acting as a key man, he knits the whole organization of management and workers together.

MANAGEMENT OBJECTIVES



As he is part of management, it is important that the supervisor understand management. Management serves three important masters.

The Customer by providing goods and services when they are needed, in the quality required, and at the cost the customer will pay.

The Employees by meeting the needs of all the prople in the company organization by providing equitable wages, good working conditions, and rewarding jobs.

The Community by providing profit for investors and other risk takers. In turn, a profitable enterprise contributes to the needs of the community by providing taxes, jobs, income, and corporate responsibility.

The management of any company can be divided into three categories. "Top Management", "Middle Management", and "Supervisory Staff or Line Management". While most foremen and supervisors fit into the last category, they are still a part of management and must recognize their responsibilities as such. The definition of "supervise" is, "to direct or watch with authority the work, proceedings, or progress; to oversee". This definition states that the supervisor is in direct control of any work situation. In the phrase "watch with authority", authority can be defined as "the person whose opinion is accepted". This additional definition of authority imposes the greater duty on the supervisor of recognizing his managerial responsibilities and becoming an effective part of management, of accepting his accountability for loss control.

In any work process the resources of management, men, equipment, machines and environment are consumed. However, there can be wasted resources through ineffective control of incidents, accidents, and injuries. The basic task of a supervisor is to maintain production while using these resources in the most economical manner. To develop and maintain an effective control over the use of resources, the supervisor should understand and use the "Functions of Management".

THE FUNCTION OF MANAGEMENT

PLANNING	Thinking which precedes any action. Methods and means of doing job.
ORGANIZING	Fitting of resources to fulfil the plan. Development of authority and responsibility within the work group.
STAFFING	Getting the right person into the right job.
DIRECTING	Having the workers operate in an economical and efficient manner. The training, orientation in work methods, and procedure that workers will require during their employment period should be followed up by the supervisor to ensure safe working habits.
CONTROLLING	Examining results, establishing standards, evaluating differences, and correcting problems.

"Planning" is the thinking which should precede any action. It is the means ensuring that the procedures and job processes will use the resources economically and the job will continue without interruption. It could also mean that a Job Hazard Analysis has been completed to ensure that accidents and incidents are planned out of the job processes. The training of workers in the procedures must be adequately planned to ensure proper understanding. At the same time, some thought should be given to the possibility of emergency incidents and accidents which can arise, such as power failure, machine failure, fire, etc., and what emergency action should be taken.

When the supervisor has a plan of how he is going to complete the job, he must then determine what resources he needs and what he has available. He then apportions the resources available to fit the plan. He must organize his manpower to have a sufficient number when needed. He must have the various trades and machines on the job at the right time in the right order. He should develop some sort of organization, who should do what, to control the job and delegate the necessary Authority, Responsibility and Accountability. This type of organizing is developed only after there is an understanding of what the various tasks are.

The function of "Staffing" means getting the right person in the right job. Each individual worker is different from the other. Each has different talents, capabilities, etc. Each likes to use his best skills. The whole organization would operate better if each worker were using his best skills, but too often the supervisor does not know what skills a worker may possess. If no workers have the necessary skills, additional training may be required to provide the skills. Too often the function of Staffing is misunderstood and the job is modified to fit the individual worker instead of the worker fitting the job.

Probably the largest portion of a supervisor's job is the function of "Directing". This function is concerned with keeping people at work and keeping the productive processes going. Directing starts with the orientation given to a new worker. It continues with the initial job training given in company practices and procedures. This training is an essential which is so often missed. A worker may understand and be able to use the tool, but does he understand how they are to be used by a particular work group? Has he been properly integrated into the work group? Does he know where he fits?

Another aspect of Directing often missed is the issuance of orders which keep people at work. Too often the worker has no definite understanding of the job because the requests made did not tell him exactly what was required. We give people a job, a responsibility, but never tell them what the responsibility actually is.

The final function is that of "Controlling"; of making sure that the productive processes are going according to the plan, that the resources are being used for their intended purposes. Controlling is the measurement of the results against the plan and determining the reasons for any difference. It can be seen that there must be some standard of quality, quantity, economy, etc., established before any effective control can be imposed. Losses can only be determined when measured against a standard.

It should be recognized that incidents and accidents are evidence of lost control over part of the work processes. As supervisors control and are responsible for the use of resources, they must recognize that they have an accountability for any losses which occur in their area of responsibility. Production is no longer a one man job. It is an integrated process in which the outputs of a number of workers are added together in a definite sequence. The supervisor is responsible for maintaining the integration of the process and its uninterrupted continuation. However, control over the losses which occur can be maintained by understanding and using the "Functions of Management", more particularly those of Directing and Controlling.

There are other aspects of a supervisor's job which are not often recognized. Leadership, and the ability to get workers to follow the designated procedures, is vitally important. Leadership is defined as "giving direction by going in front". This definition infers that the supervisor knows the processes and procedures which are to be followed and is willing to show the way. It also infers the development of a sense of loyalty, of discipline within the work group. These attitudes should be sufficiently developed so that the production processes will be maintained at the same standard whether or not the supervisor is present.

In addition, there must be an appreciation of the supervisor's responsibilities to higher management and to the workers.

The supervisor is the only part of management who has direct contact with and control over the workers. Consequently, the responsibility for vertical communication between higher management and the workers is very important. The supervisor must translate management's ideas into terms the workers can understand and transmit the information to the workers. He must also reverse the flow of information.

A good supervisor will possess all, or most, of the following attributes:

I. Knowledge of Work
  a) He will have a complete and comprehensive knowledge of the tasks being performed by the workers.
  b) He will be fully conversant with all work processes and procedures in his department and always be alert to the possibilities of improving them.

II. Awareness of Responsibility
  a) He will recognize and accept his responsibilities to both management and the workers and exercise the authority delegated to him in an impartial manner.
  b) He must recognize the fact that safety and production are different parts of the work situation.

III. Leadership
  a) He must possess above average qualities of leadership and thus create, among his workers, a strong sense of loyalty towards the job.

IV. Instructional Ability
  a) He must be able to impart knowledge and understanding by instruction. It is essential, not only for new employees, but in conducting periodic refresher training and training for new procedures.

V. Personal Characteristics

a) He must consider the workers as individuals and recognize their personal differences.
b) He must be understanding of their likes, dislikes, peculiarities, motivations, and basic reactions.
c) He must be capable of recognizing his own strengths and weaknesses as they may be reflected in his effectiveness as a supervisor.

There are many more attributes desirable in a good supervisor but the foregoing illustrates, clearly, the broad scope of knowledge and skill, plus the versatility required in this key figure in any industrial organization.

It is suggested that the supervisor should follow these guidelines:

- Ensure orders say what needs to be done.
- Do not interfere. If things look wrong, ask why they are not right.
- Find out reasons not excuses. There is no excuse for not asking.
- Do not check things. Train the worker to check for himself.
- Make clear what standards must be met. If the worker cannot conform because he needs help, help him. If he cannot conform through lack of ability, he needs an easier job. If he cannot conform because he will not conform, get rid of him. A worker's behaviour should be entirely his own responsibility.

Making a worker responsible for his own job, and a supervisor responsible for training him, creates numerous benefits in the running of a business. It means the supervisor must have a clear understanding of job standards, of expectations, and must continually clarify to workers exactly what is expected of them.

Summary of Responsibilities Relating to Production

The worker is responsible for meeting production expectations and reporting all associated problems immediately.

The supervisor is responsible for training and directing workers to meet production expectations, and controlling and correcting all failures to meet production standards.

The superintendent is responsible for co-ordinating all resources needed by workers to meet production expectations.

The manager is responsible for formulating production expectations, and authorizing resources compatible with those expectations.

THE HUMAN ELEMENT

People are motivated by their needs, both material and human. Material needs, such as wages, prospects of promotion, lunch room facilities, etc., are of different importance for every worker. Material needs can be met by the conditions of employment. Usually they involve money. They include such things as holidays, pensions, parking facilities, etc. Besides the "Dollar Factor", material rewards have other characteristics. They are never enough - people always want more. Furthermore, they can be manipulated, - wages increased or increases with-held, lunch rooms made bigger or closed off. They do not provide the satisfaction from the work itself.

A supervisor should avoid interfering with the material rewards. Let the employer decide whether to pay more, or less, to attract the right kind of worker. The supervisor should always give every worker the benefits that they are entitled to. Trying to gain better performance by allowing a worker longer coffee breaks, or threatening to cut off overtime does not work. Disciplinary penalties should be used very carefully as they may antagonize a mature adult worker. Generally if a worker is not responsible and enthusiastic, these penalties may be a waste of time. However, there are occasions, as with a new or inexperienced worker when disciplinary penalties may have to be used. If he is continuously late for work, ignores work rules, etc., a warning or suspension may be enough to show that the supervisor is serious.

The strictly human needs are generally the same for everybody - companionship, recognition, self-esteem, satisfaction, etc. It is in this area of human needs that the supervisor can gain most control and has the best opportunity for success. Actions that meet human needs, such as recognition and challenge, are quite different from material rewards. They have no dollar measurement. They cannot be manipulated, and do not have to be regularly improved the way working conditions do. These human rewards are provided by the work itself, and they are either there or missing. A worker is either challenged or bored, recognized or pushed around, successful or frustrated.

Let us look at these human factors, beginning with social needs - the need to reduce conflict between workers and allow teamwork to develop. Such conflict usually arises because of poor job arrangements. An example is the sharing of tools or equipment. Any worker can be angered by the condition the previous worker left the equipment in, or by having to wait for another worker to finish using it. Wherever there is unfriendly rivalry, check carefully to see whether it could be arising from difficult arrangements on the job making co-operation impossible.

More common than interference from fellow workers is interference from the supervisor which deprives the worker of recognition. Everyone needs to feel his worth is recognized, and just telling him is not enough. If the worker is competent, then he doesn't need instruction, orders, suggestions of help unless asked for. Training a worker and then putting him in charge of his job is the only genuine way to recognize his ability and his importance to the company. Everyone likes to feel successful. Nobody enjoys being a failure.

Only when a worker is told to be, and allowed to be totally responsible for his own job, can he work successfully. Only when he is responsible will a worker make every effort to avoid production failures. He must know what has to be done, be told the job is entirely his and that he alone is responsible for everything he does, or does not do. He alone is responsible for what happens to his equipment and his production.

Interference in the form of "help" can deprive a worker of a motivating factor that few workers can live without - challenge. Recognizing and solving problems, exercises the intellect and stirs the driving force of human endeavour - the need to redirect our environment and leave a mark upon the evolution of the universe. Pity the worker whose supervisor is always there to help - who spots the problems, suggests the solutions, makes the adjustments, and is always right! This interference, which may save a few dollars, can cost tenfold in destroying a worker's willingness to recognize and solve all kinds of future problems by himself. The worker feels like a servant, and will only do what he is told to do. Since problems are handled by the supervisor, the worker never has a chance to be successful. Nor does he have a sense of failure when things go wrong - it was the supervisor's fault, so he feels frustrated and angry.

Only by letting a worker take charge of his job, and face the problems of his job, can a supervisor provide the greatest motivation of all - achievement. The most satisfactory day's work is experienced when all problems have been faced and successfully overcome. The supervisor's job is to help the worker, but unless the worker says so, the supervisor will not know there is a problem. The supervisor who can tell when to help, and when it is better not to help, is allowing the worker to experience a feeling of achievement - the basis of self-esteem.

Workers who do not seem to care about their work, who are not interested in the work require attention to their human needs. Clearly these needs are not being met by their work. Chances are they are not allowed to be good at their jobs, but basically are expected only to follow instructions. If things go well and the instructions were good, the supervisor gets the credit. If things go wrong, the supervisor gets the blame. In other words, the workers can be neither successful nor a failure. So how can productivity or quality be of any interest to them? Is there any reason why they should care? If they were allowed to make their own decisions, based on proper training and responsibility, things would soon change. Nobody enjoys being a failure, and they would very soon make sure their work was successful. They would begin to achieve quality, productivity, and self-esteem.

COMMUNICATION

All transfer of information among people is communication. Not just factual information, but ideas and questions, feelings and emotions, are also communicated. Words may be used to convey facts, or turned around to convey feelings through sarcasm, jokes, etc. Information can also be conveyed by tone of voice, facial expressions, or simply by actions. Here we shall consider only communication by words, not by actions, face, or tone of voice. Communication by facial or tonal expression is not a problem - it is in fact only such face-to-face communication that will ensure there is no unintended deception.

Words are frequently misunderstood, no matter how clear the message may be to the sender. Misunderstanding comes from poor grammar, wrong words, ambiguities, ("all the money you get should be bills" - who's Bill), multiple meanings, (get a tap with the correct thread and make it fast), uncertain meanings (two parts empty), trade terms (there's a grizzly at the top of the elevator), etc., etc.

Even when the words are well chosen, they may not be heard properly or understood as intended. There can be many distractions, such as noise, the job, outside influences, the speaker, etc. Noise is not meant only as the roar of traffic or a "jack-hammer" when talking about communications but also people saying the same thing over and over again. We know what they are going to say so we don't bother to listen. We tune them out because they keep repeating themselves. The speaker starts to say something and the listener assumes that he knows what the speaker is going to say and stops listening. Sometimes the emotions are roused by a particular word, such as "grievance", "overtime", "safety", etc., and as a consequence the listener stops listening and communication is lost. Unless special effort is made to ensure clear communication, there will be many unwanted results. Misunderstanding can destroy friendship and co-operation or create anger and frustration. It can lead to production errors and accidents. It can cause people to quit or be fired.

Successful communication can be achieved by developing four habits. They are not aimed at careful choice of words, avoiding distractions, or anticipating personal problems with each listener. Those would be impossible tasks. Rather, they are habits that will compensate for such problems, and ensure successful communication in spite of them.

Firstly, sincerity is essential to communication of important messages. Using sarcasm or jokes to see if the recipient is smart enough to understand is foolish. It is hard enough to avoid misunderstanding with direct words - only trouble can be expected if we deliberately choose double meanings. Worse still, once a supervisor makes every communication an opportunity for testing and ridicule, workers will cease to try and communicate. No supervisor can work successfully without the confidence of his crew, and adequate communication.

Secondly, successful communication must recognize the interests of the recipient. The needs and expectations of the listener should have some consideration before formulating the message. If he doesn't need it, he won't listen. If it goes against his expectations, he will take it as a threat or insult. Where some unexpected information must be given, it should always be in two stages. The first stage, preferably spoken and not requiring any decision, will allow the recipient to think about it, to express his reaction and his concerns before a final message is delivered.

Thirdly, verbal messages should be "sandwiched" between an introduction and confirmation. Before giving a message, set the scene by saying what's on your mind. For example, "I've been wondering what to do about the price list - do you have that letter?" Following the message, you need feedback to confirm it was understood. Feedback may be voluntary but must contain a relevant fact - not just "I know the one", but "the one from Fred". Where there is no voluntary feedback, ask a question or two until some response shows the message is understood. The "sandwich" therefore is:-

Say what's on your mind - give the message - ask a material question.

Finally, there must be close listening to the response to ensure that the message, or the information is understood and it is the same as was given. Listening for the understanding of our message is very difficult because we have too great a tendency to interrupt and correct. Don't!! Listen to what is being said and ensure understanding. Nobody will accept or agree with anything until there is understanding. Individuals place different interpretations on words. Listen to make certain the message received is the same as sent. Don't argue - don't criticize - don't demand agreement until the message is received and understood. Listen to make sure! Failure in communication is always the fault of those who prepare and present the message. It is no use blaming the listener, for whatever he understands the message to be, he cannot possibly know whether it is the same message the sender wants to get across. Only the sender can check there is true understanding.

Supervisors generally need to communicate far more than they do. Their job is to explain requirements, listen to the problems, and teach workers how to deal with them. Chatting about the job teaches a worker your expectations much more effectively than only speaking when he does something wrong. Also, the worker needs frequent casual conversations to make it easy for him to explain his problems. Without finding out these job problems, the supervisor will never know what to teach.

Improved communication needs planning - to create the opportunities and provide the time. This applies at all levels of production. Every supervisor needs plans that ensure he will meet with the manager, with other supervisors, and with workers both alone and as a crew. Without regular meetings taking place, there will be communication problems. Company expectations will not be understood at shop floor level, and production problems will not be understood in the office.

ACCIDENT INVESTIGATION

Nature of Accident Investigation

Contrary to popular opinion, accident investigation is not a casual reading of a few statements about an accident and then the apportioning of the blame. While such a procedure may be adequate in some of our activities, industry cannot afford such a haphazard procedure. Industrial accidents should be thoroughly investigated to determine their causes and to prevent their recurrence. Therefore, accident investigation should be a careful, thorough search into all aspects of an accident.

Accident investigation is a systematic attempt to find all the relevant facts about an accident and its occurrence. The able investigator knows in advance the kinds of information he seeks. He will gather his information from any and all available sources, eg. the injured person, witnesses, the accident scene, even a re-enactment of the accident if necessary. The investigator will not necessarily accept witnesses' statements at face value. Instead, he will evaluate the possibility of this information by measuring it against his own experience, knowledge, and judgement. After a thorough study of all the evidence the investigator can reconstruct the accident, determine what happened, and develop means of preventing a recurrence of this type of accident. Such an approach is vastly different from merely getting the workers' account of an accident. The accident investigator is no longer a mere collector and reporter of statements. He is an evaluator of facts, of opinions; he must exercise judgement and he must, above all, have a questioning attitude toward all apparent evidence.

The Purpose of Accident Investigation

There are two mistaken viewpoints about accident investigation which are often found in all levels of management. The first sees the accident investigation mainly as a means of completing an accident report or claim report. This viewpoint is often accompanied by the idea that someone "upstairs" needs the information. Such a viewpoint leads to poor investigations; the information reported is usually the minimum necessary to complete an accident report.

The second mistake sees the accident investigation as a means of determining the fault. This viewpoint is based on the premise that as an accident has occurred, somebody is at fault. Therefore, the accident has to be investigated to find out who is to blame. Such a viewpoint undoes the usefulness of an accident investigation. It leads to poor investigations that look no further once blame can be placed.

The real purpose of accident investigation is to establish all the facts leading to the cause of the accident in order that preventive action may be taken. Preventing the recurrence of an accident is the true aim of accident investigation. Every investigator should keep in mind that he is attempting to find facts not faults, to search for a solution to a problem in order to prevent its recurrence.

The Time for Accident Investigation

Accidents should be investigated as soon as possible after their occurrence. The greater the time lapse between the accident and the questioning of witnesses, victims, appraising the scene, or re-enacting the accident, the less chance of getting a true factual-complete story of the occurrence. People forget accident details very quickly, particularly under emotional shock. Witnesses will also attempt to reconstruct the accident from their own understanding of the situation and from their own viewpoint. They will add facts, fill in gaps and stretch the truth. Oddly enough, they usually do so without being aware of doing it. What starts out as a possibility, a conjecture, a plausible interpretation, ends up as an iron clad fact.

The implication is clear. The injured person's version of the accident should be obtained as soon as possible before his thinking distorts what really happened. Similarly, witnesses should be questioned with as little delay as possible before they have had a chance to influence each other's stories. The scene of the accident should be appraised before clues may be removed.

There are two exceptions to questioning the injured person first and these are: When they are in immediate need of medical attention, and when they are in severe pain. Under such circumstances, the investigation should be started elsewhere, eg. witnesses or the scene of the accident.

Who Should Do The Investigation

The investigation of accidents is the responsibility of all levels of management from the immediate supervisor to the president. Most companies, however, establish divisions of this responsibility. Serious injury or equipment damage accidents are usually investigated by safety personnel and management. First and second line supervisors usually investigate accidents that involve no disabling injuries or minor equipment damage. It is also common for the lower levels of supervision to conduct a preliminary investigation into the causes of disabling accidents. However, supervisors should be involved in all accident investigations.

There are several reasons why the supervisors should participate in the investigation of all accidents which occur under their supervision and responsibility. These are: (a) Supervisors are close to the job, working conditions, and the worker. They know the details of the jobs, procedures, hazards, environmental conditions, and any unusual circumstances. They know the workers, their personal job experience, characteristics, and understand the shop language. While such knowledge does not ensure that first line supervisors will make expert accident investigators, it does provide a good background for good investigation. (b) Requiring first line supervisors to investigate accidents that occur within their area of responsibility emphasizes the supervisor's responsibility for accident prevention. By having clerks, first-aid men, or safety personnel complete minor injury accident reports, the supervisor's sense of responsibility for accidents is undermined. (c) Supervisors need to learn the causes of accidents. To complete an accident investigation, it is necessary to recognize the hazards, causes, and accident circumstances that are likely to recur. The supervisor should recognize the hazards and causes because he has the responsibility of training new workers, checking unsafe practices, unsafe conditions, reminding workers of the hazards, and must provide the leadership in accident prevention. (d) Supervisors need to act to prevent the recurrence of accidents. Most corrective actions to prevent the recurrence of accidents, eg., re-instruction of safe job procedures, elimination of unsafe conditions, correction of the source of unsafe conditions, etc., are taken or ordered by the supervisor. When such supervisors do not investigate accidents or, at least, actively participate in the investigation, many of the necessary corrective actions simply do not take place. It is particularly true in the case of minor injuries. The supervisor has the opportunity because he is on the job; the authority, because he is the direct influence; and, the responsibility, because he is hired to maintain a certain production capacity.

What Types of Accidents Should be Investigated?

It is readily apparent that the serious or major accidents should be investigated. However, all accidents, regardless of the degree of injury, should be investigated if a control of production losses is to be achieved. Major accidents generally receive automatic investigation. There are still firms which do very little investigation, and appear to have a limited concern about accidents in general. Minor accidents and near-miss accidents should be of prime concern. These types of accidents could be considered a production loss indicator as they point to a condition or practice which, if allowed to continue, could cause a serious injury or major equipment damage. The investigation of these accidents should be as thorough as a major accident.

There is still a major problem in industry today with regard to accident investigation - "The unreported accident". Many workers will not report minor or near-miss accidents for fear of supervisory disapproval, getting a bad reputation, not wanting to lose time off the job, fear of medical treatment, fear of being called accident prone, ridicule from fellow workers, etc. If efficient production is to be maintained, a determined effort must be made to overcome this attitude. An unreported accident means; (a) nothing is learned from the experience; (b) accident causes are not corrected; (c) infection and injury aggravation could result; and, (d) the failure to report could spread to major accidents.

To summarize, accident investigation is a hard job demanding a lot of work. However, it will give the advantage in seeing all of the work methods improve, work being done efficiently, and - (injuries being reduced).

THE ANATOMY OF AN ACCIDENT

"Accident Prevention is both a science and an act. It represents above all other things, control -- control of man performance, machine performance, and physical environment. The word "control" is used advisedly because it connotes prevention as well as correction of unsafe conditions or circumstances."

- H.W. Heinrich

There are some people who believe that the type of industry, the kind of activity carried on, and the inherent hazards in the production process have a direct bearing on the accident rates. The facts do not bear out this belief. There are companies in the oil drilling industry with enviable safety records while other companies in light assembly plants have very bad accident records. Regardless of plant size or the types of goods or services, the key to a better safety record lies in the existence of safety awareness amongst the workers.

In the development of safety awareness, the aim is to condition a working mind so that, whenever there is an element of danger present, a sixth safety sense will cause him to react the proper or safe way. Some kinds of awareness are inborn traits. A person can walk into a room and immediately sense if joy or sorrow prevails. A young man sitting in a park reading a newspaper may have several men walk in front of him but if he suddenly hears the click of high heels, the rustling of a dress or smells the scent of perfume, he looks up from his paper. That is awareness.

Safety awareness, on the other hand, has to be developed. The notice given to traffic lights, warning signs, and symbols are all developed safety awareness traits. These traits are learned through training, knowledge, repetition, and correction until they become part of the work habit.

The difficulty in developing safety awareness lies in the belief that accidents are an inevitable result of fate. "When you're number is up", "the law of averages", or "accidents are bound to happen", are the stumbling blocks to safety awareness. The belief that accidents are a whim of fate makes us ignore the techniques or prevention.

To understand how accidents evolve in the production processes, it is necessary to redefine the terms used. An accident has been defined as an event in which the action or reaction of materials, or persons result in production stoppage, property damage or personal injuries. However, unless injuries occur, there is a tendency to ignore these accidents despite the resultant wastage of resources. An incident may be defined as a production interruption which did not waste resources through property damage or personal injuries.

Another definition is:-

An accident is a situation in which a previously tolerable act of circumstances is suddenly, by the adoption of another factor, rendered wholly intolerable.

It has been observed by various people that;

An accident is compounded by individuals and personalities which are unique. An accident is caused by workers who enter into the accident situation with their own prejudices, and ideas. Underlying the uniqueness of each accident is a disturbing sameness. A characteristic of all accidents is their predictability in retrospect. They seem to have a certain inevitability, they have to happen.

An accident is spawned within the flow of the work system whose picture is continually changing. Each change brings that accident either closer to or further from its occurrence.

Both the incident and the accident may be the result of a situation which was created by a series of events that downgraded personal performance and/or changed the environment so that normal action is impossible.

The downgrading of personal performances may occur, for example, when the worker has to improvise the use of tools because the Purchasing Department does not have a replacement policy. The lack of a lock-out system will allow a worker to activate a machine with the repairman inside it. The environment has been changed but the worker is unaware of the change and treates the environment as normal and tries to use the machine.

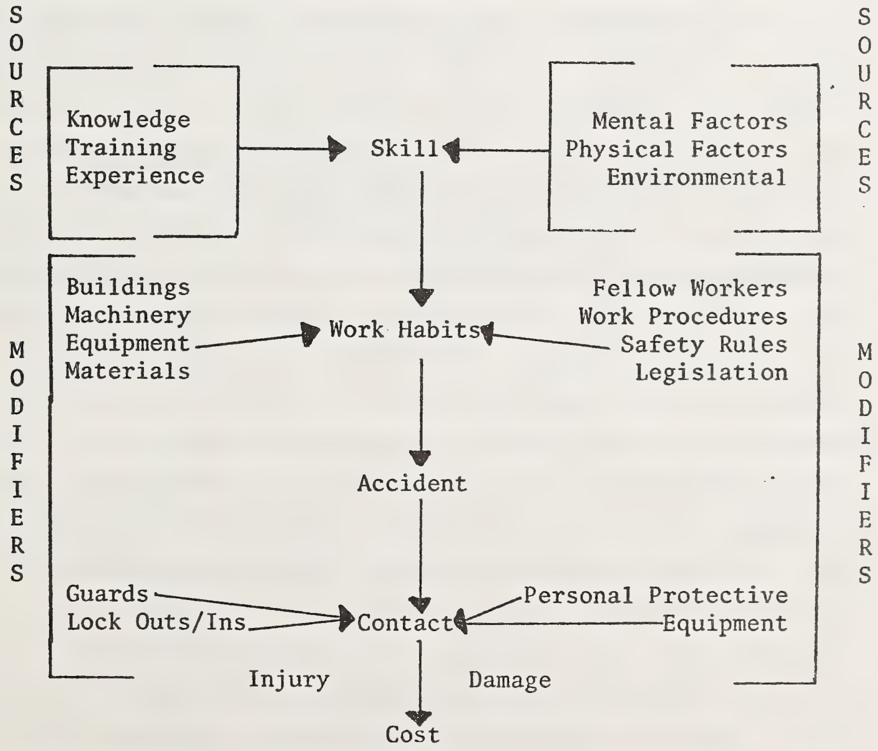
Individual performance is probably the most important factor in the whole chain of accident evolution. Individual performance, is indicative of the skills of an individual. The individual is not only a worker but also the supervisor, middle management, and top management. If management does not understand its functions or fails to carry them out, they are demonstrating poor performance records in addition to developing the basic cause of an accident. The worker may knowingly or unknowingly disregard procedures and precipitate an accident. In either case, the work skills brought to the job are lacking.

Individual performance of skill is dependent upon a number of factors and is a variable. The training, knowledge and experience that the individual has will determine his ability to do a particular task. However, his understanding of the reasons for the method of doing the tasks will determine his effectiveness. If the task is to be part of an integrated process, the individual must understand the reasons for the task and how his work is integrated into the production process. In addition, there are personal factors and environmental factors which may influence the skill of an individual. Mental pressures such as worry, anger, boredom, etc., downgrade the skills on the job just as well as fatigue, eyestrain, noise, etc.

The environmental factors, the things which management has direct control over, probably have the greatest influence over industrial losses. Too often the individual is unaware of the work environment because he concentrates on his job only and doesn't see around him. We develop certain expectations of the work environment and treat it accordingly. Occasionally the environment is changed without the individual's knowledge and he continues to act in accordance with the normal environment. An incident or accident is an inevitable result. A worker steps on a dowel on the floor. He did not anticipate a dowel on the floor because it is an abnormal situation, and nobody informed him of the dowel. Consequently, he continued walking in his normal manner and fell.

ANATOMY OF AN ACCIDENT

CONCEPT - At the time of an accident there has been an interaction of many random factors. Most of these factors can be identified and controlled.



Normal reaction of a supervisor would be to ask the worker why didn't he watch where he was walking. However, the question should be why was the dowel there? Who allowed it to remain there? It is higher management which controls the environment and systems to control the environment. Why aren't workers trained in proper housekeeping practices? Is there a clean up man in the plant? These are systems over which management has control. The supervisor determines the performance and controls the utilization of materials with the system. Therefore, the supervisor should have ensured that workers are conforming to company housekeeping standards. Consequently, if losses are occurring, they have occurred as a result of deficiencies which have evolved through ineffective management practices.

Thus, we find that an incident or accident may have had its origins where the "Functions of Management" were not understood, particularly within the managerial systems used to control work. It is a lack of skill, or a poor supervisory safety performance which allowed the accident situation to develop. On examination of the incident, it is apparent that somewhere there is a lack of training and knowledge necessary to conform to adequate housekeeping practices. It may be that the worker who dropped the dowel has had no experience with a housekeeping procedure. In addition, there may other physical or mental factors which may have had an influence over the worker at that particular time. For too long, workers have been blamed for being careless, negligent, unthinking, etc., while a particular accident may have been "engineered" to happen. It should be remembered that one isolated occurrence may indeed be an "accident". However, most of our accidents, whether injurious or not, keep recurring. Under such conditions, the person involved can't control them. The basic cause is in the way the production process is planned, the tools being used, etc.

If we put everything together we will find that accidents evolve through a definite series of events. The series started with a lack of control on the part of management. Management didn't develop an adequate training system or maintain sufficient control over housekeeping on the job.

The absence of an accident control system will allow the existence of personal or job related factors. These factors are referred to as the basic cause or underlying causes of the accident or incident. The immediate or direct cause is the last action or event before the accident or incident. Actually, the causes are symptoms of a deficiency in some managerial system. To prevent losses, it is necessary to determine why the basic causes occurred, not just try to offset these causes.

Consequently, it is necessary to understand the five principles of loss control.

PRINCIPLE I

An unsafe condition, an accident: all these are symptoms of something wrong with the management systems. Behind every accident are many contributing factors.

PRINCIPLE II

Certain sets of circumstances can be predicted to cause accidents. These must be identified and controlled. Studies suggest that injuries are predictable in certain situations. Some of these situations involve:

a) Unusual, non-routine work. The jobs that occur occasionally or the one-of-a-kind situation, such as in-plant turn around. The controls that apply to routine work have little effect on non-routine situations.

b) Sources of high energy such as electricity, steam, poisonous gases, and flammable liquids usually associated with severe injury.

c) Certain construction situations such a high rise erection, tunnelling, trenching, working over water, etc., are a blend of high severity situations.

PRINCIPLE III

Safety should be managed like any other company function. Management, including the supervisor, should direct the safety effort by setting achievable goals, by planning, organizing and controlling to achieve them. Perhaps this principle is more important then all the rest. It restates the thought that safety is comparable with quality, cost and quantity of production.

PRINCIPLE IV

The key to effective safety performance is management procedures that fix accountability. Anybody will achieve results in those areas in which his superior is measuring him.

PRINCIPLE V

The function of accident control is to locate and define the operational errors or deficiencies which allow accidents or occur. This function can be carried out in two ways: By asking why - searching for root or basic causes of accidents; and by asking if effective controls can be utilized. It can be seen that accidents don't just occur, but they develop over a period of time because the management, the people who control work process, either don't or won't understand the necessity of applying the Principles of Accident Control because accident control or safety is not something apart from efficient production. Economical and efficient production is production in which losses are controlled and accidents kept to a minimum.

OCCUPATIONAL HEALTH

Health Hazards in Industry

Toxic substances, whether liquids, dusts or gases, can irritate, injure, cause sudden or premature dealth. Many of them play a vital part in industrial processes and we cannot ban them outright. How do we keep the hazards within safe limits? We must know all the characteristics of the materials we are using and assess the hazard in relation to the way in which they are being processed. Then we must substitute a safer material, if one can be found. If there isn't one, we must contain the hazard, by total enclosure or by other means such as ventilation. If these fail, we must give protection (equipment) and make sure it is effective.

Routes of Absorption and Symptoms

Inhalation. This is the major route of entry for airborne chemicals. The chemicals can have a direct effect on the nose, upper respiratory tract and the lungs or they can enter the blood stream and thus affect the blood, bone, heart, brain, liver, kidneys, or bladder.

Ingestion. This is not normally a direct route or entry from exposure except by willful or accidental ingestion. Materials can also enter the stomach through indirect means. For example, the lung has a cleaning mechanism which pushes material out of the lung where it then can be swallowed. This can result in an exposure to most of the internal organs or even in a local action on the stomach wall.

Absorption. Some materials are absorbed through the skin and when they enter the blood stream they can be transported throughout the body and accumulate in, or affect, the most sensitive areas of the body. Skin contact can also result in an allergic type of reaction, the removal of the protective skin oils, or dermatitis. In some cases chemical contact may result in a cancerous lesion.

Irritation. Irritation or a burning sensation is the result of materials which adversely affect the nasal passages, the respiratory tract, the skin and the eyes, eg., ozone gas from a carbon arc causes irritation to the upper respiratory tract and the lungs. Other materials have irritant effects and are also poisons, eg., toluene. Lung sensitization, which results in an asthmatic type of reaction, can occur from inhalation of some irritant gases, vapors or dusts. Once sensitized, a person would not be able to continue working with these materials since any further inhalation will cause a reaction.

Contact Dermatitis. Dermatitis or a skin eruption can be caused by the irritation of a chemical upon skin contact. Although the result can be a blister, rash or scar, it is reversible after the contact has stopped. Sometimes, medical attention is necessary.

Sensitization Dermatitis. (allergic dermatitis). This disease is caused by chemicals (such as chromic acid) which are called SENSITIZERS. It has a more long term effect than contact dermatitis. It can develop upon first contact with the chemical or it may occur after repeated exposure. Once it begins, it can become irreversible and often spreads to other parts of the body. Once sensitized, a person would not be able to work directly with the material that caused the sensitization since further skin contact, even inhalation, can reactivate the dermatitis. Patch testing by a dermatologist may determine the sensitizer. We cannot stress enough the need for personal protection in order to avoid this problem.

Central Nervous System Depression, or narcosis. This is caused by a variety of chemicals which enter the body through inhalation, ingestion or skin absorption. On continuous exposure the symptoms progress from headache, dizziness, blurred vision, uncoordination, mental confusion, weakness and fatigue to eventual loss of consciousness.

People are becoming aware of and concerned about the effects of industrialization on themselves and the environment.

Historically, disease caused by working in various environments was accepted as part of the job. For example, workers in the hat-making industry used mercuric nitrate in the felting of fur and consequently suffered mercury poisoning. One of the symptoms was a central nervous system disturbance which gave rise to the expression "mad as a hatter" in folk language. In more recent times, gross exposures to chemicals of unknown toxicity (eg. vinyl chloride monomer, ketone) have given rise to irreversible diseases.

EXPOSURE LIMITS

The human body has a variety of defence mechanisms against most toxic materials, but beyond a certain limit the defence mechanisms break down or are overloaded, resulting in cell, tissue or body organ response. Animal research and human studies have defined a level of exposure where there is no adverse reaction. This level or dose is used as the basis for setting industrial exposure limits.

The Alberta Government adopted exposure limits for airborne chemicals in the work environment. These are called Threshold Limit Values (TLV's) and set by the American Conference of Governmental Industrial Hygienists on the basis of industrial experiences of humans, and animal research. It is thought that exposure for up to eight hours per day at or below the TLV should result in no adverse health effects. Most of the limits are based on a Time Weighted Average (TWA) concentration. Therefore, some exposure above the TLV is allowed providing a pre-determined maximum limit is not exceeded for more than fifteen minutes and the average is maintained for that day. For a few chemicals, the TLV is a ceiling limit and no exposure above the limit is allowed. The TLV's are based on exposure by inhalation, but some chemicals can have direct local action on the skin or may be absorbed through the skin into the body. Special precautions have to be taken with these chemicals since guarding against inhalation alone may still result in physiological reactions if there is physical contact.

NOISE

Noise is a problem in many areas, and it effects approximately 10% of the workers in Alberta. An essential aspect of noise-control is the establishment of acceptable noise levels for the area or process under observation. If an acceptable noise level cannot be attained by engineering changes, adequate hearing protection must be provided to the worker.

Occupational Exposure Limits

Occupational Exposure Limits refer to sound pressure levels and durations of exposure that represent conditions under which it is believed that nearly all workers may be repeatedly exposed without suffering permanent hearing impairment. The sound levels to which a worker may be exposed vary with the duration of the exposure and are given in the following table.

Duration Per Day (hours)	Sound Levels (dBA)
16	80
8	85
4	90
2	95
1	100
1/2	105
1/4	110
1/8	115 max.

The above limits are for the Province of Alberta.

Supervisors need to pay attention to all aspects of occupational health. They should think about the fitness of the worker for the job, and about the health dangers in the work area. Having established a safe match between the worker and workplace, they should ensure it is working out - watch for any symptoms of a health problem and their possible cause.

Some specialized knowledge helps the supervisor choose workers fit for the job. Workers suffering from diabetes or epilepsy may not be able to work safely in certain areas. There are other special weaknesses, such as arthritis or spinal defects, allergies, and sensitivity to certain chemicals or solvents that may lead to severe skin problems.

At the first indication of a fitness problem, medical advice should be sought about placing the worker in a suitable job.

Some of the other questions, relating to symptoms and hazards are listed in the appendix, along with remedial action. Health hazards are a highly technical matter, and the supervisor should be concerned with getting proper information. No chemicals or solvents should be used until the supervisor knows what they are, and every worker has been informed of whatever hazards each substance may cause. Wherever there is any uncertainty about the hazards of the environment, a hygienist should be asked to investigate the situation.

Personal Protective Equipment

The last resource available for guarding against injury is personal protective equipment. However, personal protective equipment is the solution to a hazardous situation when no other solution is found to be practical. Far more is achieved through the use of adequate safe-guards on machines and methods of operation than through the use of personal protective equipment. Supervisors should be aware that when personal protective equipment is provided, it is the final and ultimate source of protection. However, personal protective equipment is only as effective as the wearer allows it to be.

Eye Protection

Safety glasses, goggles and face shields have long been considered the basic method of eye protection. The type of eye protection to be used must protect against the type of hazard in a particular situation. Spectacle type safety glasses are not adequate protection against chemical splash or spray. For this hazard, a complete face shield should be used. The type of eye protection must be appropriate for the hazard.

RESPIRATORY PROTECTIVE EQUIPMENT

In general, the main conditions which require the use of approved respiratory protective equipment are as follows:

	SOURCE	SYMPTOMS	ACTION
NOISE	Machines, tools & appliances	Prevents quiet conversation Misses conversation Seems to be deaf at parties	Screen off Increase distance Remount of modify Ear Protection Have it tested
LIGHT	Sun & Incandescent	Temporary blindness Eye fatigue, headaches Excessive use of flashlights	Increase general lighting Install local lighting
HEAT	Hot objects Hot atmosphere	Blisters Rashes, sweat & weakness	Screen off hot objects Ventilate hot atmosphere Protective clothing
SKIN DISEASE DERMATITIS	Excess rubbing or pressure Heat, cold, radiation Dusts and fluids Biological infections	Rashes	Medical opinion Change material, method or equipment
CARBON MONOXIDE	Lift trucks Motor vehicles Heating equipment	"Afternoon headaches" Irritation, etc.	Ventilate Service the equipment Change the fuel Reduce usage Have it tested
DUSTS, FUMES & SOLVENTS	Grinding & polishing Powdered or dusty materials Solvents Hot materials and processes	Either acute or chronic coughing Difficulty in breathing	Identify all substances Obtain data sheets Change the material Local exhaust Breathing apparatus Have it tested
RADIATION	Radioactive testing X-Ray equipment Lasers	Burns Lethargy	Get expert guidance
SYNOVITIS	Repetitive awkward hand or wrist movements Using impact tools Using small hand-held	Pain, stiffness, loss of feeling & excessive cold	Redesign the work operation Change machine

1. Where there is an oxygen deficiency;
2. Where there are gaseous contaminants
    a) which are immediately dangerous to life
    b) which are not immediately dangerous to life;
3. Particulate contaminants such as dusts, fumes, smokes, mists, or fogs; and,
4. Combination of gaseous and particulate contaminant;
    a) immediately dangerous to life
    b) not immediately dangerous to life

Oxygen Deficiency

Atmospheres in confined spaces such as wells, mines, shelves, tanks and burning buildings may have a low oxygen content due to the displacement of air by other gases or vapours, chemical reaction or absorption by other substances. Oxygen deficiency may be caused by fire, decay of organic material, by chemical processes or natural oxidation over a long period of time. The only protection against oxygen deficiency is equipment which supplies oxygen either as air or in the pure form to the wearer. Filter respirators and gas masks are useless against oxygen deficiency.

Gaseous Contaminants

a) Gaseous Contaminants Immediately Dangerous to Life

These are gases which are present in concentrations that would endanger life even if breathed for a very short time. To determine whether the gaseous contaminant is immediately dangerous to life, the nature of the contaminant should be known and its concentration measured. If this can not be done, it should be considered as "Immediately Dangerous to Life". Some gases are extremely dangerous even in low concentrations. Examples of these are Arsine, Bromine, Chlorine, Fluorine, Phosgene and Hydrogen Sulphide. Other gases are dangerous at relatively higher concentrations on short time exposures such as Sulphur Dioxide. The best protection is breathing apparatus.

b) Gaseous Contaminants Not Immediately Dangerous to Life

These gases are present in concentrations which could be breathed for a short time without endangering life, but which might produce discomfort or injury after a prolonged single exposure or repeated short exposures. Again we need to know the particular gas involved and its concentration before declaring it not immediately dangerous to life. Examples of such gases would be nitrogen, carbon dioxide, vapours from hydrocarbons such as gasoline, toluol, Xylol and chlorinated hydrocarbons such as trichlorethylene, and methyl chloroform. The protection needed is breathing apparatus.

Particulate Contaminants (dust, fumes, smokes, mists & fogs)

These may be classified into three main groups according to their reaction in the body.

Group 1 - Toxic Particulates

These may pass from the lungs to the blood stream and hence to various parts of the body where they may cause injury. The effects may be chemical irritation, systemic poisoning or tumors. Well known examples are lead, arsenic, manganese, mercury, phosphoric acid, sodium hydroxide and radioactive materials.

Group 2 - Fibrosis

Certain dusts are not taken up by the blood stream but remain in the lungs to cause pulmonary impairment. Examples of these are free silica, asbestos, coal and bauxite.

Group 3 - Nontoxic and Nonfibrosis

Other dusts, generally called nuisance dusts, may dissolve and pass into the blood stream or remain in the lungs with no effects. Examples of these dusts are dusts from cotton, grain, feathers, fur, wool, etc. These are not always necessarily harmless since some people may be allergic to them.

These particulate contaminants may also be classified according to their physical properties as follows:-

1. Solids such as dusts and fumes;
2. Liquids such as mists and fogs; and,
3. A combination of solid and liquid such as silica, water sprays and paint sprays.

The majority of particulate contaminants are not immediately dangerous to life but take days, weeks, even years of exposure to produce harmful effects. Exceptions are dusts, and mists or sprays which in high enough concentrations can injure or kill a man in a very short time. Protection from particulate contaminants may be obtained by the use of; dust, mist or fume type respirators, air-line respirator or abrasive blasting respirator.

Combination of Gaseous & Particulate Contaminants

Atmosphere may contain gaseous and particulate contaminants at the same time. They may be different substances such as carbon monoxide and the oxides of nitrogen from blasting together with the dust from the blasted material. They may be the same substances in liquid and vapour form. Where such a combination occurs, special care should be used to obtain protection from both contaminants. If one of the contaminants is immediately dangerous to life this will dictate the type of protection required.

Protection Required

a) Immediately dangerous to life - Self contained breathing apparatus or air-line respirator with escape bottle.
b) Not immediately dangerous to life - Air-line respirator, Hose mask with blower, Chemical cartridge respirator with special filter.

Now having discussed the conditions under which respiratory protective equipment is required, we will now talk about the protective devices available, their limitations and precautions in use.

These devices are classified into two main groups:

1. Atmosphere supplying respirators
2. Air purifying respirators

There are four main types of self contained breathing apparatus:-

a) The recirculating type where the exhaled air is passed through chemicals to absorb the carbon dioxide and the remaining oxygen is reused being automatically supplemented by oxygen from a cylinder as required.

b) The breathing atmosphere is supplied by means of an oxygen cylinder, non-recirculating.

c) The breathing atmosphere is supplied by means of a compressed air cylinder, non-recirculating.

d) The self generating oxygen type where the exhaled air passes through chemicals which generate oxygen flowing to the breathing bag.

Precautions and Limitations

1. The wearer must be in good health and well trained.
2. The wearer should know and use the time limited of each type of apparatus.
3. The wearer must make sure apparatus is in good working order before using.
4. The user must make sure it is fitted properly and is supplying the required air. Test before entering into a contaminated area.
5. If wearer can detect any contamination by odour, taste, or eye, nose or throat irritation, he should return to fresh air at once.
6. Where oxygen is used the equipment should not be contaminated by oils or grease.
7. The self generating type should be started in clean air. It should be noted that this is a one use device and should be discarded after use.

Hose Type Respirators

Here again, there are four main types of this class of respirator.

1. Hose mask type where the air is supplied by a blower.
2. Hose mask type without a blower.
3. Hose mask type where the air is supplied by a compressed air line.
4. Abrasive blasting respirator, same as air line supplied respirator, but constructed to protect head and neck of wearer.

a) With Blower

1. The hose length must not be over 150 feet (65.5 metres).
2. If using more than one hose line, both should be connected directly to the blower.
3. The user should wear and check for proper operation before entering the contaminated area.
4. The user should take care that hose line is not endangered by sharp edges and falling objects.
5. The limitation of this device is the length of hose the wearer must leave by same route as he entered.

b) Without Blower

1. Take same precautions as with blower type.
2. Use only in atmosphere where wearer can escape unharmed without the respirator.
3. Each device should be checked for its own limit.
4. Ensure air intake end in contaminated area and protected from accidental displacement.
5. Wearer must leave by same route as he entered.

c) Air Line Respirators

These are of two types, one which supplies air to the face piece as required by the wearer, and in the other the air flow is continuous.

d) Abrasive Blasting Respirators

These are essentially the same as the continuous flow type of air line respirator except they are constructed to protect the head and neck of the wearer.

Precautions and Limitations of Air Line Respirators

1. The length of the hose limits the wearer's movements.
2. The air supplied must be free of carbon monoxide, objectionable odours, oil and water, mist and rust particles. Low pressure externally lubricated blowers are preferable to compressors.
3. The rate of air flow to face piece should be 4 cfm; for helmets or hoods, 6 cfm.

Air Purifying Respirators

Air purifying respirators remove the contaminants from the air which make it respirable. These respirators can not be used in an oxygen deficient environment. They are divided into three main classes.

1. Chemical Filters
2. Mechanical Filters
3. Combination of chemical and mechanical filters.

Chemical Filter Class

a) Gas mask
b) Chemical cartridge
c) Self rescue

a) Gas Masks

They consist of a canister containing the appropriate chemicals, a full face piece and body harness.

They are designed to provide protection from specific gases such as, chlorine, nitrous oxide, organic vapours or various combinations. There is also a universal gas mask canister for protection from a variety of contaminants including carbon monoxide.

Limitations of Gas Masks

1. They are limited to atmospheres containing 16% or more of oxygen and not more than 2% of most toxic gases.
2. Where carbon monoxide is the contaminant, the canister must have an indicator to show when it should be replaced.

3. The canister should be used for the contaminant for which it is designed.
4. The mask should be fitted and tested before entering a contaminated area.
5. The face piece should not be removed until wearer is sure he is in a respirable atmosphere.
6. Time exposure limits of canisters should be carefully noted and adhered to.

Chemical Cartridge Respirators

These are similar to the canister type respirator except the chemicals are contained in cartridges which are attached to the face piece.

Limitations

1. Their use is limited to atmospheres not immediately dangerous to life.
2. It should only be used where there is a fairly low concentration of gases or vapours, approximately up to 1000 ppm.
3. They are never used for gases or vapours which can not be detected by smell or for highly toxic contaminants such as phosgene or arsine.
4. They are never used in an atmosphere irritating to the eyes.
5. The cartridge should be discarded when the odour of the contaminant can be detected by the wearer.
6. The knitted face piece covers should not be used as they allow vapours or gas to enter.

Self Rescue Tube Respirators

These are similar to the chemical cartridge type respirator but are carried on the body or stored at the work station ready for instant use when required. They have the same limitations as the chemical cartridge type. There is one designed for use in a 1% by volume carbon dioxide atmosphere.

Mechanical Filter Respirators

Mechanical filter respirators are designed ro provide protection from a single specific, dust, fume or mist, a single class of toxic dusts or a combination of several classes of particulate matter. The filters may be the single use or reusable type.

Limitations and Precautions

1. They do not protect against gases, vapours or oxygen deficiency.
2. When breathing becomes difficult it is necessary to change the filter.
3. They should not be used in sand or shot blasting operations.
4. The use of these in high concentration requires the frequent replacement of filters.
5. Reusable type filters should not be washed or dry cleaned.

Combination Chemical Mechanical Type Respirator

These remove toxic gases and vapours and particulate matter from inspired air. They can be canister type or cartridge type chemical respirators with particulate filters attached. These have the same limitations as gas masks, chemical cartridge and mechanical filter respirators as mentioned previously.

Then any area is contaminated with substances such as hydrogen cyanide, phenol, aniline, nitrobenzene or any other substance which may be absorbed through the intact skin in sufficient amounts to be toxic, none of the above mentioned respiratory devices are sufficient. For such exposures, a complete protective suit of impervious clothing including respiratory protection is necessary. Such suits are available and designed for various hazardous exposures.

Selection of Respirators

Before the proper selection can be made, each of the following factors should be considered.

1. Determination of the hazard (oxygen deficiency, gas, particulate or a combination).
2. Severity of the Hazard - determine if the hazard is immediately dangerous to life.
3. Gaseous - if gaseous, it should be determined if the contaminant is an acid gas (chlorine), organic vapour (gasoline amonia, carbon monoxide or mixtures).
4. Particulate - if contaminant is a dust, fume or mist, it should be determined whether it is the toxic type (arsenic, antimony lead, etc.), pneumoconiosis producing type such as free silica or asbestos, or the nonfibrosis producing type such as floor or wood dust.
5. Concentration of the Contaminant - the concentration of the contaminant should be determined. Where ammonia is over 3% and other gases over 2% by volume, a gas mask is not adequate. If the organic vapours are over 1000 ppm, a chemical cartridge respirator is not sufficient. In the case of particulates, if the filter plugs up too often then an air line respirator should be used.
6. Period of Required Respiratory Protection - the length of time of exposure must be known. The self contained breathing apparatus, the gas mask, and chemical cartridge types are good for a limited period. When using hose mask with blower, the air line type respirator, time is unlimited.
7. Location of Contaminated Area with Respect to Source of Clean Air - the source of clean air must always be free of contaminants and upwind, outside of the contaminated area.
8. Activity of the Wearer - the activity of the wearer has a marked effect on the life to be expected from a self contained breathing apparatus gas mask, chemical cartridge or particulate respirators. The greater physical effort of the wearer, the lesser the time that the respirator will be effective.

What the Wearer Should Know

1. Why the respirator is needed.
2. How it operates.
3. Testing steps to assure that it is in good operating condition.
4. How to properly fit the respirator.
5. How to maintain and use it properly.

Finally, workers should be trained by actually handling, fitting, testing, and wearing the respiratory under normal air conditions and finally, in an irrespirable atmosphere which is not immediately dangerous to life. Only when properly trained, should workers be allowed into hazardous atmospheres.

BUDDY SYSTEM

Another safe-guard which should always be employed in areas of toxic fumes, dust, gases, etc., is the "buddy" systems, two workers will operate together at all times. One worker enters the confined space with the other tending the life-line attached to an approved safety belt worn by the first worker. Should anything befall the individual in the confined space, he has a means of rescue. Under no circumstances should any worker enter any enclosed vessel without having somebody standing by in case of an emergency.

Personal Equipment

Hard hats, safety shoes, gloves, and normal work clothing should be worn where required on the job. These are the normal requirements for safe, efficient production. A great deal has been said about the use of personal safety equipment. All sorts of arguments have been presented both pro and con. However, it should be realized that the present systems of safety standards have evolved from a long, arduous, and injurious experience. We can no longer replace the trained worker immediately. Modern technology has progressed too far and the cost of replacing an injured worker has grown too high. Personal safety equipment, if it is required to be worn, should be made a condition of employment and there should be no exceptions.

Safe, efficient production and loss control can only be maintained with proper respect for the safety policies and procedures under all circumstances and conditions. To achieve the safe, efficient production, the supervisor must ensure that the worker conforms to the policies and standards as stipulated by the company.

JOB PROCEDURES

Preventive Measures means preventing accidents from happening rather than their correction after occurrence. Therefore, it is in the interest of safe, efficient production for the supervisor to enforce the company safety policies and procedures as a prime method of accident prevention and loss control. Work procedures are recognized as necessary to good job performance, orderliness, economy, and safety.

Safe Operating Procedures

Supervisors who believe in loss control and accident prevention rather than correction, naturally place great stress on motivating employees to work properly - to follow safe operating procedures. Supervisors have discovered that wherever safe practices and procedures are ignored, other procedures are also ignored. Therefore, the policies and procedures should be written and published for all employees to read and understand. Standard procedures give control of operations, and adequate control results in safety. In addition to work standards, there should also be standards of safe practices and safety procedures. Most employees will agree with any reasonable action taken by supervisors to maintain reasonable standards of performance. Conversely, they resent being told to observe certain safety procedures only to see them ignored by other employees, supervisors, management, or plant visitors.

Despite the fact that supervisors and workers agree that safe operating procedures are necessary, they will also agree that certain procedures are continuously violated, and the violations are disregarded. It is not surprising because, when attempting to understand the reason for particular procedures, we find that they are out of date and no longer apply.

The following is a suggested check list for validating safe practices and operating procedures.

a) Is the procedure needed?

b) Does the worker understand the need?

c) Does he think it was something dreamed up by the front office?

d) Do safe operating procedures change with conditions?

e) Are there too many safety rules?

f) Are the safety procedures and policies so general as to have no meaning?

g) Are the procedures practical from the worker's viewpoint?

h) Is each hazard, covered by a specific procedure, actually safe?

i) Are these procedures limited to safety matters?

j) Did the worker, affected by the procedure, participate in developing it?

Hazards

Most accidents result from a combination of unsafe performance and unsafe environment, seldom only the one. Many so-called acts leading to accidents have been caused by faulty design or construction, poor housekeeping, poor operating practices. Often the systems used to control production create hazards by so confusing the operator that he is literally forced to make a mistake. Thus, potential accidents are built into the machines, equipment and processes used.

A principal objective of the supervisor in the development of a safe work environment is the elimination of bottlenecks, stresses, and strains, and booby-traps that interfere with the flow of work. In developing safe work conditions, attention should be given to many things, including machine design and machine guarding, personal protective equipment, plant layout, manufacturing procedures, lighting, heating, ventilation, removal of dust and fumes, and the reduction of noise. Adequate consideration of each hazard will lead to increased loss control and productivity.

There are certain inherent characteristics in machinery which, if left unguarded, will produce injuries. Certain questions might well be asked when considering the safety of any operation:-

1. What factors in the operation create an unsafe environment (eg. unguarded pinch points, inadequate clearances, flying particles, dusts, fumes, flammable materials, irritating chemicals, unusually high or low temperatures, conditions likely to cause trips, falls, or slips, etc.)
2. Should the hazard be identified by colour codes, warning signs, or barriers?
3. Should interlocks be used to protect the worker?
4. Is it necessary to design the machine, electrical circuit or the pressure circuits so that it will always fail safe?
5. Is there any standardization of design, controls, etc?
6. Are lockouts used for maintenance and repair operations?
7. Is a "Work-Permit" system practical?
8. Is there a need for emergency controls and are these controls easily identified and accessible?
9. Are the job hazards explained to the worker when training him how to avoid the hazards?
10. What additional hazards would be created if proper operating sequence were not followed?

Safety Devices

Attention must be paid to such control devices as fail-safe switches or devices. These fail-safe features are incorporated as a control so that in the event of a malfunction or breakdown, the equipment will be shut down, stopped or idled. Safety interlocks are devices which shut down or idle a machine should a hazardous part be either deliberately or inadvertently moved, touched, or handled.

Limit switches are another safety device which limits the load of the distance, etc., of machine capacity or movement. Should the limits be exceeded, the limit switch will automatically shut down the machine. These are emergency controls which can over-ride all the operating controls of the machine.

A consideration, often missed in the development of a machine, is the position of the activating and emergency controls. Activating controls should be placed in a position where the operator has a complete view, where he can see others working on the machine, or in an area where they may get hurt by the machine, etc. Some consideration must be given to the sequence of operation and to the frequency of use of the controls. Manual controls must be located within easy reach of the operator -- in general, not higher than eye level or lower than waist level, and not wider apart than the distance from elbow to elbow when both arms are extended. When controls are activated by the feet, guards must ensure that the hands are not in a hazardous area or that the foot controls can be activated by mistake.

Guarding

The importance of machinery as a source of injuries in industrial accidents is clearly demonstrated when Alberta Statistics show that 28% of fatalities and 55% of disabling injury awards involved men and machine contacts.

In practically every case of injury both mechanical hazards and faulty behaviour were present.

Human practices and habits are difficult to combat - mechanical safeguards are permanent.

The basic principles of safeguarding equipment are:

1. Engineer the hazard out of the job;
2. Guard the hazard; and
3. Educate personnel to use the safeguards provided.

ENGINEER THE HAZARD OUT OF THE JOB

A great deal can be done to eliminate the hazards endangering operators and maintenance personnel of mechanical equipment by anticipating such hazards when plans are made for the department's layout.

The following suggestions should be observed.

1. Allow sufficient space for easy maintenance and repair.
2. Allow sufficient space for incoming and outgoing stock.
3. Mark off machine area in the same way as aisles and storage areas.
4. Supply racks for tools, jigs, and fixtures.
5. Supply containers for disposal of waste material and empty containers promptly when filled.
6. Supply area with adequate light.
7. Supply seats.
8. Have electrical motors grounded to frames.
9. Equip each power driven machine with an electrical disconnect or valve which can be locked in the 'off' position for maintenance. The switch or valve should automatically return to the 'off' position if there is any interruption in the main power supply. On restoration of power, the switch should have to be manually set to 'on' or 'run'.
10. Have a 'stop' switch within easy reach of the operator.
11. Have the working surfaces of all machines at a height which reduces the fatigue of the operator.
12. Have shaft couplings made without projecting bolts, nuts, or set-screws. If they extend beyond the smooth surface of the coupling, they should be covered with sleeves.
13. Have jaw clutch couplings with cylindrical sleeves which cover the jaws.
14. Have revolving collars made cylindrical without projecting screws or bolts or enclosed in a stationary guard.
15. Have projecting keys cut off flush.

GUARDING THE HAZARD

Too often the purpose of guarding is misunderstood.
Guarding is necessary to prevent injuries from sources such as:-

1. Workers making contact with moving parts of machines.
2. Work in progress making contact with workers, such as metal chips from grinder, kick backs from saws, etc.

3. Mechanical failure such as brake failure, overspeeding wheels, pulleys disintegrating, etc.
4. Electrical failure causing safety gates to hang up, switches to remain energized, etc.
5. Failure of valves, causing leaks, etc.
6. Human failure resulting from zeal, curiosity, anxiety, fatigue, etc.

GUARD CONSIDERATIONS

To overcome these hazards and give maximum safety to operations, machine guarding is necessary. Guards should fulfil the following requirements.

1. They should be strong enough to withstand damage from external sources, or interference with the operation of the machine.
2. They should permit maintenance without creating excessive labour for dismantling or re-assembly.
3. They should be properly mounted. The mounting must be rigid to prevent objectionable rattle or interference with working parts.
4. They should be designed so that there are no detachable parts, which if removed and not replaced, would reduce the guards effectiveness.
5. They should be so constructed that they themselves do not create a hazard. Sharp edges, exposed bolts or jagged or unfinished surfaces can cause cuts and lacerations. All edges should be rolled and bolted to reduce these hazards to a minimum.
6. Machine guards should protect the operator. The protection must be positive and control or eliminate the hazard.

AREAS REQUIRING MACHINE GUARDING

Machine guarding is divided into three logical classifications.

a) Power Transmission: The moving parts (shafting; pulleys; belts, rope, and chain drives; keys, set screws, and other projections; collars and couplings) that transmit power from the source to the working parts of the machine.

b) Moving Parts: The accessories to transmission (control or feeding devices; prime movers, cranks, connecting rods, tailrods, governors; moving heads or tables) other than direct power transmission or point of operation.

c) Point of Operation: That part of the machine which does the work on the material or object being processed.

It is impossible to discuss in detail the guarding of every type of machine or any individual machine part. It is possible, however, to reduce machine operation into a few simple mechanical movements and develop a philosophy of guarding that is valid for any type of operation.

These mechanisms rely on a rotating action or a reciprocating action (back and forth) or a combination of the two and are classified as follows:

1. Rotating mechanisms
2. Cutting or shearing mechanisms
3. Inrunning pinch points
4. Screw or worm mechanisms, and
5. Forming or bending mechanisms.

A rotating shaft is a good example of rotating motion. The danger from the shaft is enhanced when flywheels or pulleys are placed on the shaft with collars, projecting screws, couplings and keys. Rotating, cutting or shearing mechanisms include circular saws, slicers, cloth cutters, milling machines, band saws, etc.

When reciprocating motion is used, the sliding parts approach or cross a fixed part of the machine or stock such as found in shears, punch presses, forging hammers.

Examples of inrunning pinch points are points of contact between belt and pulley, chain and sprocket, or whenever a part rotates over, under, or near a stationary object. A part does not have to operate near or in contact with another to produce an inrunning pinch point. Examples of this can be seen on long belt drives, conveyors, etc.

LOCK OUT

Alberta regulations state:-

When maintenance and repair work is carried out on dangerous parts of machinery all sources of power must either be removed, locked out, or otherwise prevented from energizing the equipment or hurting the personnel engaged in the repair or maintenance task. Power to energize modern equipment comes in many forms as hydraulic fluid, compressed air, steam, gasses and electrical energy. To render equipment safe, all these sources of power must be either disconnected or blocked off in such a manner that no person can re-energize the equipment without the full knowledge of all personnel that are engaged in the work.

To ensure adequate protection, a lock-out system should be adopted. The system should have the following characteristics:-

1. Padlocks must have individual keys and the workers' keys will open his lock only. If a spare key is required, it should be kept in the superintendent's office.
2. Locks should be colour-coded for each trade.
3. Each worker should attach his own lock to the controls when two or more workers are on the same job.
4. A DANGER tag should be attached with the lock stating the location where work is being done if the controls are away from the work.
5. Components such as rams, shears, or other moving devices should be blocked off regardless of lock-out.
6. All loads should be switched off before electrical lines are de-energized.
7. Where dangerous solutions of gasses, caustics, etc., can be released, the lines must be disconnected and blinded off.

8. All blinds must be equal to the pressure specifications of the pipe and be put on with required gaskets, bolts, etc.

Lockins are used under very similar conditions to lockouts. They are used to maintain conditions or events, to maintain a positive means of isolation. They are also used to keep workers in a safe area in case of accidents, eg. a car seat belt might be considered a lockin.

Interlocks are used in numerous situations. They can be used to ensure machines don't operate if guards are opened, to ensure that the correct sequence of operation is followed, to prevent accidental operation of control, etc. Interlocks should be used after a study has been made of the whole operating procedure and the consequences resulting from a switching or sequencing error.

Job procedures should be developed from an understanding of the steps of the job. Then, based on an analysis of the hazards associated with the steps, various types of safeguards should be used to counter the hazards. Operating procedures, which detail the work methods and the personal protective equipment needed, should be developed and the workers trained in the use of the procedures. Guards are a part of the work environment which must be used, but their limitations must be recognized. Lockouts, lockins, and interlocks are all needed, particularly when maintenance and operating personnel are working on the same machine. When job procedures are understood by the whole work force, the accident rates can be reduced.

JOB TRAINING

No worker can do a good job until he knows what is expected of him. Even an experienced worker joining a new crew may have a different idea of speed, quality, and safety, than the supervisor. Unless the supervisor makes clear what his own expectations are, he should not expect any worker to do a satisfactory job. Every worker, experienced or not, requires training from the supervisor. The worker must know the techniques of performing the job, the standards of output, quality, safety, etc., and the degree of responsibility he is supposed to carry. From these three areas - techniques, standards, and responsibility, it is only the supervisor who can teach the last two. Everything a supervisor says and does, in relation to a worker, contributes to that worker's understanding of his responsibility and the standards required on the job. Training is a never-ending process.

While job instruction may be left to an experienced co-worker, the supervisor should be involved in guiding the co-workers efforts. On production line jobs, the worker must learn literally "on the job". At intervals the supervisor should take the worker off the job to show and explain what is happening at other stations on the production line. For those jobs not tied into a production line, but requiring operation of machinery, the supervisor should plan the instruction process. This means ensuring a written job procedure or manual is on hand, that time is properly allocated, the equipment made available, and that the co-worker really can do a good job himself.

Once the worker has acquired a basic skill, the supervisor himself must begin the real job of training, by teaching proper standards. For this, the supervisor must thoroughly understand the job himself. Every job has a range of standards - adequate output, acceptable quality, level of safety, amount of waste, number of mistakes, and so on. The supervisor's task is to clarify in his own mind what these standards are, and then make them very clear to the trainee, over the following days or weeks. Most workers, thought to be incompetent, careless, or dumb, simply have had no fair chance to learn what the supervisor expects. Every loader operator does not look over his shoulder before reversing until he has worked for a supervisor who explains that no other standard of operation is acceptable.

The third element of training - responsibility - is also up to the supervisor to carry out. Elsewhere on this course the need to teach responsibility has been dealt with. Now it is time to look at the method of doing it. It begins as early as possible, even at the job interview. Ask a job applicant "What makes you think you can handle this job" and he immediately gets the feeling he is going to be carrying the can - it will be "his" job - he will be responsible for what happens. Follow this up on the job by telling the worker he is responsible. "Everything you do, and everything that happens on your job is your responsibility" - "When you're not sure, always ask" - "if you're not asking questions, you're not learning anything" - "if anything looks wrong, it's up to you to come for help; don't wait for someone else to notice". Then let him do the job with a minimum of interference beyond that is asked for.

Finally, a worker's job skills are polished by the on-going behaviour of the supervisor. Watch that things are OK, but don't keep watching. Correct a few mistakes but don't correct everything. Let him know what's to be done, but don't tell him how to do it. Drop by for a lot of chatting about the rest of the operation - how sales are going, problems with new equipment, what the boss said yesterday, the next clean-up, etc. Out of these casual conversations the trainee will acquire the clearest understanding of what the supervisor and the employer, expect of him in skills, standards, and responsibility. Formal training, explanations, watching and correcting - none of these can bring about the performance that develops when a worker, through casual discussion of the activities of the operation, begins to understand the supervisor's whole way of thought.

To carry out a proper training program, the supervisor should follow certain definite steps: -

a. Preparation - self
b. Preparation - worker
c. Presentation
d. Try-out performance
e. Follow-up

The self-preparation involves a lot of study and work. The instructor must understand all the aspects of the job and their relationships. He will first break the job into its 'musts', the skeleton job which is the minimum acceptable performance. He then develops an understanding of the finer steps in the job which can make the job better than the average. With these steps in mind, he will set the objectives of what the worker is to learn within a given time period. The instructor will also gather sufficient background material from his knowledge of the operation or process to explain why the task is done in a certain manner, why certain equipment is used, where certain hazards exist, why certain personal protective equipment must be used, etc.

When preparing the worker to receive the instruction, the trainer should be aware of the individual's nervousness at using strange equipment in a strange environment. Try putting the worker at his ease by allowing him to voice his understanding of the new task. Once he is interested and has relaxed, place him in the operator's position, ensuring he has the proper equipment and personal protective equipment to do the job.

Then, Present the Operation! Tell him, show him, illustrate the task, one step at a time from start to finish. Go right through the task stressing the key points. In this way the worker is oriented to the task. He can see the end results, now having satisfied his curiosity, go back to the beginning and repeat the steps slowly and clearly. Cover no more than three steps at a time without ensuring understanding. Question the worker, make him give the reasons for operating in a certain manner. When three steps are known, carry on with the next three, etc., until the complete task is known and understood.

When the instructor is reasonably certain that the worker does understand the task, then let the worker try out his performance. Have him do the job, but accept the fact that he is going to make mistakes. Correct the errors immediately and start over again. Have the worker explain the reasons for operating in a certain manner, using certain equipment, etc. Continue the repetition until the instructor is certain that the worker can do and does understand the task with reasonable proficiency.

A SAFETY PROGRAM

An organized safety program is used to arouse and maintain interest in accident/incident prevention. It is generally applied to the injurious results of accidents. The safety program is not something which operates outside the normal work processes, but must be an integral part of the production processes. Control of losses, incidents and accidents and the associated injuries can be gained through a more effective control of the work environment and the actions of the workers. In other words, everybody on the job has to contribute and do his fair share if the program is to be successful.

A safety program is composed of a number of elements. Some of the main ones are:-

a) Supervisory leadership. The attitudes of the workers generally reflect the attitudes of the supervisors. Consequently, if the supervisor is not genuinely interested in loss control and accident prevention, no worker is going to be. Supervisors, foremen, etc. must demonstrate an interest not just talk an interest. While the major responsibility for actually working safely rests with the worker, the supervisor has the responsibility of ensuring that the worker understands the reasons for safe work practices.

b) Safe working environment. The environment in which the productive processes are carried out must be safe and suited to the job. Pre-job planning will take care of a smoothly flowing work process. Facility appraisal will help to provide a reasonably hazard-free environment. However, there is no guarantee that the hazards cannot be replaced by others. Consequently there has to be a program of inspection by both workers and supervisors to make everybody aware of the hazards in the environment. There must be a constant use of Job Safety Evaluations, particularly when the job is an uncommon one. There must also be times set aside for practising the use of emergency personal protective equipment, such as breathing apparatus, etc. Fire drills, emergency evacuation practices, practice rescues, etc. should also be carried out. It is too late when the emergency occurs.

The safety program can never be successful without the active interest and participation of the workers. To gain their participation, they must be involved in the various activities which make up the program.

Safety Committees. The Safety Committee has two basic functions:-

i) Creating and maintaining an active interest in safety; and
ii) Serving as a means for safety promotion and communication.

Such committees can be extremely helpful in developing better attitudes towards safe work practices, and allowing workers to share in their development. They also help to disseminate interest and information by the personal contact to the committee members.

The safety committee could occupy itself with the following functions: -

i) Discuss and recommend safety policies and practices to management;
ii) By visual inspection, discover and correct unsafe work practices and conditions;
iii) Teach safe work practices and off-the-job safety practices to members for further instruction to plant members;
iv) Discuss loss problems and accidents and develop means of preventing their recurrence; and
v) Improve the co-operation between management and workers in developing a safe work environment.

Because an organization has a good safety committee, it does not mean that such things as pre-job meetings, tail-gate meetings, general safety meetings, etc. should be dispensed with.

Crew Meetings. These meetings are sometimes called tail-gate meetings, lunch-box meetings, etc. However, it is not recommended that too many meetings be held during the lunch break. The purpose of the meetings is to cover one particular problem in a short time. A definite time should be established and a time limit set for the meeting of the supervisor and his crew. The supervisor should start the meetings with a particular problem topic. Further topics would be supplied by the workers themselves.

The supervisor should explain the problem and solicit solutions from the workers. The purpose of the meeting is to get the workers to accept decisions through their own input and agreement. Crew meetings should be used particularly when doing the "once-in a while" job. Everybody needs their memories refreshed.

Contests. Accident prevention contests are also a useful means of promoting a safety campaign. The contest should be planned and conducted by a committee representing the competing groups. This committee could, or maybe should, be the safety committee. The rules of the contest should be developed by this committee with a minimum of outside interference. While the scoring system should be fair to all groups, it must be simple and easily understood. Good publicity is also necessary as are awards which have some prestige value. One disadvantage of a short time contest is what to do when the contest is over.

Awards. Because of the sense of disappointment or let-down at the end of a contest, a number of companies have developed an awards system. This system is based on each worker's own safety record. The worker may be awarded a number of prizes dependent on the accident-free time requirements.

Posters and Displays. Posters are the most visible evidence of accident prevention work but they must be used in conjunction with other types of safety promotion as they tend to have a negative effect. When posters are selected, the following purposes should be kept in mind:

1. Posters should remind workers of common human traits that cause accidents;
2. They should impress workers of the good sense of working safely;
3. They should inspire a friendly interest in the company safety program; and
4. They should remind workers of specific hazards.

Occupational Health & Safety Division has a large number of posters on various topics and approximately eighty films that can be used to assist in the promotion of a safety program or theme.

Personal Protective Equipment

Where hazards exist and investigation has determined that it is impractical to eliminate them by guarding or design change, then the use of personal protective equipment must be depended upon to protect the worker. To ensure maximum protection, selection of the proper type of equipment is essential. Two major points should be considered; the degree of protection that the equipment will afford and the ease with which it may be used. Proper fitting is necessary for many items. Enforcement of rules concerning the wearing of personal protective equipment may well be needed. No infringement of rules applicable to its use should be permitted.

Special Equipment Training

If personnel are required to use specialist equipment such as air breathing apparatus for rescue work or entry into confined spaces, then it will be necessary to arrange special training and regular practice in its use.

Safe Work Procedures

Any hazardous operation should be checked by conducting a job hazard analysis on the job operation to determine hazards that may not be readily recognizable and to establish safe work procedures. Safe work procedures should eliminate maximum accident potential from any job operation. Procedures should be written and used in the instruction of employees new to that particular operation.

Safe Work Permit System

Special job operations of a hazardous nature that are not part of the normal work routine and not covered by safe work procedures should be conducted under a Safe Work Permit System. This system is designed to prevent injuries to personnel, damage to building, plant, materials and equipment where hazards such as the following are encountered: atmospheres that are toxic, explosive, corrosive or deficient in oxygen, extreme temperatures, confined spaces, combustible materials and electricity.

Company Safety Rules

Company safety rules should be reviewed yearly and updated when necessary. All safety rules including revisions, should be authorized by the senior executive prior to being published. This booklet should always include full information on the Tagging and Lock-out System.

Emergency Procedures

No company, plant or organization is immune from the possibility of a catastrophe. Emergency action therefore must be planned for if losses are to be kept to a minimum and employees' lives protected. Major considerations in disaster control planning must include protection of personnel, evacuation of all personnel, injured and uninjured and first aid care.

Emergencies wherein injuries to personnel and property damage can occur are: work accidents, fire and explosives, floods, winds or hurrican force and civil strife. Emergency procedures should therefore be planned in conjunction with community services, i.e. fire, police, hospital, etc., and the Alberta Disaster Services.

Off-the-job safety is a very important aspect of any safety campaign. It is acknowledged that off-the-job accidents cause nearly as much production loss as on the job accidents. It is not only the worker's health and safety that matters, but also his family's. A worker with an injured child in hospital does not have the interest in his work that he should have and consequently becomes more susceptible to accidents and injuries himself. Therefore, it is to the company's advantage to develop an off-the-job safety campaign. By directing these campaigns on a seasonal basis, e.g. boating safety, swimming safety, gun handling, etc., as well as at home accidents, further production losses can be curtailed, and a better integrated work force maintained.

An effective safety and accident prevention program is a reflection of the interests and participation of all members of the company's staff. It cannot be left to the workers alone. The workers must be involved but they must have the leadership provided by effective supervisors.

FACILITY APPRAISAL

Physical inspections of the work-site are important tools of loss control. Too often an inspection is performed without a clear understanding of its purpose. Therefore, it is suggested that a periodic appraisal, as well as inspection, be carried out. To appraise means "to look upon and to bring together facts to exercise judgement, to evaluate as to quality and status". Consequently a safety appraisal means a great deal more than a safety inspection.

The main objective of a safety appraisal is to monitor the results of the accident control program and to initiate means of correcting or nullifying the hazards. These hazards may be an unsafe condition of the work environment, tools, etc. or the unsafe practices of the workers involved in a job process. Not only is the appraisal made to confirm that existing hazards and unsafe work habits have been corrected, but also that new ones have not developed in the interim.

There are certain goals of safety appraisal which must be met to realize the objective of preventing accident and losses. The goals should be:

a) To ensure that the physical resources, machines, equipment, and environment are in good operating condition, are properly safe-guarded, and are not worn, damaged or removed;

b) To ensure that the materials used in production processes do not create a health hazard, either instantaneously or cumulatively, or that they do not promote an explosive or fire hazard;

c) To ensure that machine guards, safety appliances, personal protective equipment, fire equipment and first aid equipment are adequate and being used, and in the proper location;

d) To ensure that all means of access and egress, such as aisles, floors, stairs, ramps, etc. are being maintained in a safe and satisfactory condition, and

e) To ensure that all work practices conform to the company standard operating procedures based on approved safety standards.

Because the work environment is changing continuously, facility appraisals should be considered under three different conditions.

a) The facility at rest. This condition is when the production process has stopped. It is during this time that the machines, tools, guards, etc. can be appraised for wear and tear. This is the time when preventive maintenance programs should be carried out.

b) The facility at work. Generally accidents and losses occur while the production processes are being carried out. This is the time for an appraisal of the work practices, the health hazards, the contaminants, etc. It is during the production periods that a better evaluation can be made of explosion and fire hazards, and of methods to cope with these hazards.

c) The facility in disaster. By appraising the facility at work it is possible to understand the catastrophic potentials of explosion, fire and major accidents. We must now define how the facility is to cope with such a catastrophy. Is the fire fighting equipment capable of limiting the fire until the municipal fire department arrives? Should some work crews be trained as fire fighting crews, as first-aid teams, as evacuation crews, etc.? Is there an emergency lighting system immediately available along with rescue apparatus? Are workers trained and periodically tested in its use? This appraisal, based on a practical disaster control plan, should be carried out annually at the department head level.

It is generally agreed that management is responsible for the environmental conditions and for the effectiveness of the workers involved in the production process. Consequently, it is reasonable for the supervisor to accept the responsibility for the primary safety appraisal. The supervisor should conduct the appraisal of his own area of responsibility both by himself and in conjunction with others. If, during the appraisal, he asks the question "Why are these here"? of both the environmental conditions and the acts of workers, the answers may point out deficiencies in the managerial systems used by the company. Remember, it is the systems used which control the numbers of similar losses, not the individuals involved.

The supervisor should also be involved in secondary appraisals, those done by groups of supervisors in conjunction with safety and other specialists. The appraisals are needed to validate to higher management the necessity of larger modifications to the work environment and work processes. They also help the supervisor to develop his awareness of the hazards of the work environment.

The safety appraisal is not a cursory inspection but a study of the work situation to determine the hazards involved in a work process and how they may be controlled. Therefore, the appraisal must be done continually by the person directing the work process, the immediate supervisor.

Worksite Inspection

Establishing and maintaining a hazard free work environment is a two stage operation. The first stage consists of regularly scheduled inspection of powered tools, machinery and operating equipment by designated personnel. This inspection should be carried out by those individual items. In effect, the safety inspection and the preventive maintenance activity become one function.

Items that pass inspection and those items that have been returned to safe operating status should be identified with a colour coded tape for identification by the user and by members of the safety audit team. Those items that, for any reason, cannot be brought to safe operating standards, should have a signed, dated "Danger - Do Not Use" tag applied. In the case of operating equipment/ machinery that cannot be brought up to standard for a period of time, the Danger Tag and Lockout" system (where it applies) should be used. Senior management and the responsible supervisor should be notified immediately of the inspection results so that remedial action can be taken.

The frequency of inspections will vary with the industry and the amount of use the conditions under which the various items are used. Generally speaking, "daily use" items such as powered hand tools, should be inspected on a monthly basis. Mobile equipment should be safety checked when the normal maintenance schedule is being carried out. Fixed equipment also should be safety checked during the normal maintenance schedule. A practical schedule can be arrived at after a trial period in a particular industry. It should be clearly understood that planned regular safety inspections of tools, machinery and equipment is a back-up system to the user/ operators daily check. It is the responsibility of the user/operators daily check. It is the responsibility of the user/operator to assure him/herself that the item they are in charge of meets minimum acceptable safety requirements.

What to Inspect

Consideration should be given to the following categories as they apply to your job:

1) Atmospheric Conditions: dust gases, fumes sprays, illumination and noise.
2) Electrical Equipment: switches, cables, outlets, connectors, grounds and connections, fuse boxes and transformers.
3. Fire Fighting Equipment: extinguishers, hoses, hydrants, sprinkler and alarm systems and access to equipment.

4. Handtools and Powered Hand Equipment
5. Material Handling Equipment: conveyors, cranes, hoists forklifts, hoppers and dollies.
6. Personal Protective Equipment: hard hats, safety glasses, respirators, gas masks, first aid facility, hearing protection, safety belts and lines, protective clothing, and self-contained breathing apparatus.
7. Pressurized Equipment: boilers, tanks, piping, hoses, couplings, valves and compressed gas cylinders.
8. Machine Shop Equipment: mills, shapers, cutters, borers, pressers and lathes.
9. Personnel Support Equipment: ladders, scaffolds, high platforms, catwalks, staging and safety nets.
10. Power Source Equipment: gas and steam engines and electrical motors and diesel engines.
11. Transport Equipment: trucks, motorized buggies or carts, and earth moving equipment.
12. Warning and Signalling devices: blinker lights, warning signs, sirens and mirrors.
13. Protective Guards: gear covers, pulley and belt screens, work point guards, railings and warning barriers.
14. Safety Devices: valves, emergency switches and cut-offs, warning systems and limit switches.
15. Control Components: start up switches, steering mechanisms, speed controls and manipulating controls.
16. Mechanical Power Transfers: gears, cables, belts, drives, shafts and chains.
17. Point-Of-Lift Components: handles, eyebolts, lifting lugs, hooks, slings, chokers and nets.

Using a checklist is of great value for re-checking corrective actions from previous inspections.

Worksite Safety Audit

The second stage of maintaining a non-hazardous work environment is an on-going safety audit system. A safety audit differs from the first stage inspection in that it covers all the components, including work activity, that generate production within a specific area.

The main objective of a safety audit is to monitor the results of the loss control program, and bring to the attention of senior management the areas in which the loss control system(s) are not being properly applied. Audit teams should consist of two/three persons, one of which should work in the area being audited. All levels of supervision should take part in safety audits on a rotational basis. Safety, like any other management responsibility, must be carried out through the line organization to obtain satisfactory end results. Therefore, the audit is primarily a supervisory responsibility. Payroll members can be added to the audit team roster as befits any particular operation.

The safety audit in addition to the suggested items listed below should be carried out with an overview of the orderliness in the work environment. The term "orderliness", by definition, means specifically that at any moment during the work period every piece of equipment, material, tool or apparatus should be stored, stacked, located, placed, spotted or set up for use in such a manner that:

a) They will not cause an accident; and
b) They will benefit material handling, work accessibility, accident and fire prevention.

This idea applies to shelves, benches, cabinets and rooms, as well as to floors, buildings, yards and areas. All items should be placed or stored in a north/south or east/west pattern, using a wall, building, fencing, roadway or other similar point of reference. When orderliness is practiced as routine method of operation, as mentioned above, the over-all effect is a far reaching benefit on accident prevention.

Items (powered tools, machinery, equipment, etc.) which are found to be deficient during the safety audit should have a "Danger - Do Not Use" tag, signed, dated and applied. The item and location should be noted on the audit report and the responsible supervisor shoudl be notified at that time. The time cycle of safety audits will vary with the industry, as will the time cycle of tool/machinery/ equipment inspections. Generally speaking, the following schedule has proved effective in various industries.

Construction:	weekly
Manufacturing:	monthly
Mercantile/Office/ Institution:	quarterly
Continuous Process Type Operations:	monthly, combined with the continuous monitoring systems inherent in such operations (e.g. quality control, etc.)

A properly conducted safety audit, in conjunction with a summary of accident and potential major incident investigations, will present management with an accurate picture of the effectiveness of accident prevention activity and will clearly demonstrate where the system requires upgrading.

The following is an example of a safety audit checklist that can be used as a guide in developing one for your operation.

SAFETY AUDIT CHECK LIST

	Condition O.K.	Needs Corrective Action
Unsafe Practices		
Note all violations of standard work practices within the company policy.		
Identify the incident(s) in such a manner the person(s) immediate supervisor will be aware that a problem exists in his/her area of responsibility.		
Bulletin Boards and Safety Signs		
Clean		
Readable		
Material changed frequently		
Material removed when obsolete		
Protective Clothing and Equipment		
Equipment and clothing in good condition		
Equipment and clothing used when needed		
Additional equipment or clothing needed		
Sufficient storage space for equipment		

	Condition O.K.	Needs Corrective Action
FLOORS		
Loose material		
Slippery, wet or oily		
Badly worn or rutter		
Garbage, dirt or debris		
STAIRWAYS AND AISLES		
Passage ways, aisles, stairs clear and unblocked		
Stairways well lighted		
Aisles marked and markings visable		
LIGHTING		
Lamp reflectors clean		
Bulbs missing		
Any dark areas		

	Condition O.K.	Needs Corrective Action
MATERIAL STORAGE		
Neatly and safely piled		
Passageways and work areas not blocked		
Fire extinguishers and sprinklers clear		
MACHINERY		
Machines and equipment clean		
Machine areas clean		
Sufficient containers for waste materials		
Guards on and operating		
No drips or oil leaks		
Cut-off switches accessible		
BUILDINGS		
Windows clean and not broken		
Painting and upkeep satisfactory		
Door jambs clean		
Fire doors unblocked		

	Condition O.K.	Needs Corrective Action
EMPLOYEE FACILITIES		
Drinking fountains clean		
Locker rooms and toilets clean		
Soap and towel supply satisfactory		
TOOLS		
Right tools for the job		
Tools used correctly		
Tools stored properly		
Tools in safe condition		
Electrical hand tools grounded, used properly		
ELECTRICAL		
Motors clean		
No exposed wiring		
Temporary wiring removed		
Switch boxes closed		
Proper fusing		
TEMPORARY WORK SURFACES		
Ladders		
Scaffolding		
Staging		

	Condition O.K.	Needs Corrective Action
WALKWAYS AND ROADWAYS		
Aisles		
Ramps		
Docks		
Walkways		
Roadways		
STRUCTURAL OPENINGS		
Shafts		
Pits		
Sumps		
Drains		
Other Openings		
STORAGE FACILITIES		
Racks		
Shelves		
Bins		
Cabinets		
Closets		
Floors		
Yard		
HAZARDOUS SUPPLIES AND MATERIALS		
Flammables		
Explosives		
Acids		
Caustics		
Toxic Materials		

	Condition O.K.	Needs Corrective Action
PRESSURE		
Gauges working properly		
Cylinders secured from falling		
Pressure vessels inspected regularly		
STEAM		
Steam or water leaks		
Insulation condition		
GASES, VAPOURS, DUST AND FUMES		
Ventilation all right		
Masks and breathing apparatus available where needed		
Dust collection system satisfactory		
MATERIAL HANDLING EQUIPMENT		
(Check for cleanliness, safe condition and operations)		

	Condition O.K.	Needs Corrective Action
Cranes, platforms, cabs, walkways		
Chains, cables, ropes block and tackle		
Industrial trucks		
Conveyor-drives, belt condition, guards		
Elevators, hoists		
Hand trucks, wheelbarrows		
Railroad - tracks, signals and signs		

FIRE PROTECTION

	Condition O.K.	Needs Corrective Action
Hoses and extinguishers well marked		
Hoses and extinguishers well not blocked		
Extinguishers inspected regularly		
Alarm system operable		
Evacuation system set up		
Emergency procedures posted		

The results of the safety audit should be presented to the senior manager, who in turn, should assign departmental responsibility for corrective action, and ensure distribution through the line organization.

SAFETY HAZARD TO BE CORRECTED

Department: Fabrication

Location: East Wall Bay # 3

Date: May 12

Machine: Drill Press

Hazard: Stop and start electrical contact buttons, located in back of machine.

Correction Necessary: Transfer these contacts from rear of machine to location at ridge of table directly in front of operator. (Note: for location see assembly of Machine next to Drill Press in question)

Work To Be Done By: Order issued on Maintenance Department

Work Completed: Satisfactorily - May 20

WEEKLY INSPECTION REPORT OF TRUCKS

(Example)

Unit # ____________

CONDITION OF:

Steering Mechanism ____________

Directional Lights ____________

Head and Tail Lights ____________

Marker Lights ____________

Rear View Mirror ____________

Flags for Projective Material (Number) ____________

Fire Extinguishers ____________

Winch and Cable ____________

Extra Head and Tail Light Bulbs ____________

Preliminary Accident Report ____________

Spare Tire ____________

Is all unnecessary Material removed? ____________

Brakes ____________

Trailer Brake Mechanism ____________

Horn ____________

Flashlight ____________

First Aid Kits ____________

Truck Tools ____________

Jack ____________

Chains ____________

Wipers and Defrosters ____________

Truck Flares ____________

Fuses and Containers ____________

Fuse Kit ____________

Remarks ____

____

____

____

Miscellaneous ______________________________________

____

____

____

Signed ______________________ Date ______________ 19 ____

SPECIAL CALENDAR FOR INSPECTIONS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cranes	1	1	1	1	1	1	1	1	1	1	1	1
Hoists	2	2	2	2	2	2	2	2	2	2	2	2
Presses	15	-	-	15	-	-	15	-	-	-	-	15
Ladders and Scaffolding	5	5	5	5	5	5	5	5	5	5	5	5
Power Trucks	8	8	8	8	8	8	8	8	8	8	8	8
Auto Trucks	10	10	10	10	10	10	10	10	10	10	10	10
Small Tools	15	15	15	15	15	15	15	15	15	15	15	15
Portable Electrical Equipment	15	15	15	15	15	15	15	15	15	15	15	15
Goggles	10	10	10	10	10	10	10	10	10	10	10	10
Elevators	15	15	15	15	15	15	15	15	15	15	15	15
Grinders	5	5	5	5	5	5	5	5	5	5	5	5
Air Operated Tools	15	15	15	15	15	15	15	15	15	15	15	15
Slings and Chains	10	10	10	10	10	10	10	10	10	10	10	10
Pressure Tanks	-	-	15	-	-	-	-	-	15	-	-	-
Fire Equipment	20	20	20	20	20	20	20	20	20	20	20	20
Wash Rooms	20	20	20	20	20	20	20	20	20	20	20	20
Exhausts	25	25	25	25	25	25	25	25	25	25	25	25
Acid Storage	5	5	5	5	5	5	5	5	5	5	5	5
Dust Counts	10	10	10	10	10	10	10	10	10	10	10	10
Fumes	10	10	10	10	10	10	10	10	10	10	10	10

CRITICAL PARTS INSPECTION INVENTORY

Dept./Branch	Area Inventoried	Super. Responsible	Inv. Reviewed By	Page No.

1. Items Inventoried	2. Critical Parts	3. Conditions to Observe	4. Frequency	5. Responsibility

GUIDEPOSTS FOR MAKING THE CRITICAL PARTS INVENTORY

Check These Categories as a Guide to Listing Items on Inventory

1. ATMOSPHERIC CONDITIONS - eg. dusts, gases, sprays, fumes, also illumination
2. BUILDINGS AND STRUCTURES - eg. windows, floors, stairs, doors, roofs, walls, etc.
3. CONTAINERS - eg. scrap bins, disposal receptacles, carboys, barrels, gas cylinders, solvent cans, etc.
4. ELECTRICAL EQUIPMENT - eg. switches, outlets, cables, grounds, connectors, connections, etc.
5. ELEVATORS, ELECTRIC STAIRWAYS, AND MANLIFTS - eg. controls, cables, safety devices, etc.
6. FIREFIGHTING EQUIPMENT - eg. hydrants, extinquishers, hoses, sprinkler systems, alarms, etc.
7. HANDTOOLS - eg. wrenches, screwdrivers, hammers, etc., also power tools.
8. HARARDOUS SUPPLIES AND MATERIALS - eg. explosives, flammables, acids, caustics, toxic chemicals, etc.
9. MATERIAL HANDLING EQUIPMENT - eg. cranes, conveyors, hoists, fork lifts, etc.
10. PERSONNEL PROTECTIVE EQUIPMENT - eg. hard hats, safety shoes, safety glasses, respirators.
11. PRESSURIZED EQUIPMENT - eg. vats, tanks, boilers,. piping, hoising, etc.
12. PRODUCTION AND RELATED EQUIPMENT - eg. any equipment that processes materials into more finished products, eg. mills, shapers, cutters, borers, presses, lathes, etc.
13. PERSONNEL SUPPORTING EQUIPMENT - eg. catwalks, ladders, scaffolding, high platforms, sling chairs, staging, etc.
14. POWER SOURCE EQUIPMENT - eg. steam engines, gas engines, electrical motors, etc.
15. STRUCTURAL "OPENINGS" - eg. sumps, shafts, pits, floor openings, including those usually kept covered
16. STORAGE FACILITIES AND AREAS - eg. bins, racks, cabinets, shelves, tanks, closets, etc. Also yard and storage areas.
17. TRANSPORTATION EQUIPMENT - eg. automobiles, railroad cars, trucks, motorized carts, buggies, etc.
18. WALKWAYS AND ROADWAYS - eg. ramps, docks, walkways, aisles, vehicles ways, etc.
19. WARNING AND SIGNALLING DEVICES - eg. sirens, crossing lights, blinker lights, warning signs, etc.
20. MISCELLANEOUS - All items that do not fall into any of the categories above.

FILL IN THE INVENTORY FORM FOLLOWING INSTRUCTIONS OUTLINED BELOW

1. ITEMS INVENTORIED	2. CRITICAL PARTS	3. CONDITIONS TO OBSERVE	4. FREQUENCY	5. RESPONSIBILITY
List each specific item in your area that falls in any of the categories above in this column.	Identify those critical parts and/or exposures of each item that should be inspected regularly, eg. safety devices, guards, controls, work or wearpoint components, electrical and mechanical components, fire hazards, etc. Consider those parts and/or exposures most likely to develop unsafe conditions due to stress, wear, impact vibration, heat, corrosion chemical reaction, misuse, etc. Complete column 3 for each part and/or exposures before listing the next part of exposure.	List the specific unsafe conditions for which one should inspect each part or component. Use words like: jagged, sharp-edged, crooked, splintery, broken, mutilated, frayed, worn, deteriorated, corroded, leaking, explosive, flammable, vibrating, missing, loose, inoperative, deficient, slipping, unstable, decomposed, defective, excessive, littered, gaseous, rotted, spillage, etc. Give the most precise definition possible. Describe how to identify the hazard and measure its severity whenever possible.	Indicate how often the parts and/or exposures should be inspected. Use words such as: before use before issue when serviced daily weekly monthly bi-monthly quarterly yearly	Record here the person who, by virtue of his responsibility, knowledge, qualification or availability, should inspect the parts. Use names such as: Area Supervisor User Operator Maintenance Personnel Etc. Dual responsibility may be assigned. Use abbreviations if desired.

MONTHLY SAFETY INSPECTION FOREMAN MEMORANDA

Date ________________ 19 ____

Our objective is - to "see" and "correct" before the accident occurs -- by an inspection of YOUR department by YOU. You are expected to spend at least one hour each month, and return your report by the fifteenth to Mr. _________________________.

HOUSEKEEPING: Aisles ____________ Piling __________ Floors ________

Racks ____________ Rubbish __________

ALL TOOLS: Condition __________ Use _____________ Kind __________

Methods ___________ Guards __________

PERSONAL PROTECTION: Goggles __________ Respirators __________

Gloves ___________ Clothing ____________

MISCELLANEOUS: Ladders ___________ Slings __________ Trucks _______

Lifting and Handling ______ ____________ Eye Bolts ____

Fire Hazards ____________________________ Dust & Fumes __

Health ____________ Recent Accidents _________________

Your Department Problems _______________________________

Individual Hazards ______________________________________

REPORT:

The following were noted and disposed of as indicated. Orders were marked "Safety".

1. ____

2. ____

3. ____

Signed ___________________________________ Department _______________

Inspection Made (date) ___________________ 19 ____ Time (hours) __________

In order to carry out safety inspections and safety audits effectively, there must exist a known standard of minimum acceptable requirements. These standards are available in the Alberta Occupational Health & Safety Act and Regulations. For advice on, and interpretation of the various sections of the Act and Regulations, the following agencies exist under the Occupational Health & Safety Division:

Inspection Branch
Research & Education Branch
Medical Services Branch
Occupational Hygiene Branch
Laboratory Services Branch
Radiation Health Branch
Mines Branch

In small industrial operations where the work force is under the direct supervision of one person or under a shift supervisor, using the Act and Regulations as a reference should prove adequate. On larger multi-phase operations or those industrial activities that are decentralized, communication becomes a major problem. In these situations, minimum acceptable requirements to cover the inspection and audit functions should be written as safety procedures and included in the company safety policy manual.

In summary, a worksite safety inspection/audit program that is properly planned and executed results in a safe physical environment, and provides the necessary foundation upon which all other accident prevention activities can be successfully based.

ACCIDENTS AND ATTITUDES

Almost every accident can be said to have resulted from an unsafe act, an unsafe condition, or both. Have you ever thought of the reasons people act unsafely and often tolerate or create unsafe conditions? How often have you heard answers such as -- carelessness, doesn't give a damn, he's stupid, he should have known better, he's been told dozens of times --? There are not logical reasons from which to formulate subsequent steps of corrective action.

Hunter P. Wharton, President of the International Union of Operating Engineers, made the following statement in an article on Safety: "Every time a non-mechanical accident occurs, a human failure has occurred -- and that human failure was in large part shaped by the attitude of the workman".

"Attitude" is a word we hear continuously these days in the field of accident prevention. According to several dictionaries, it means "a settled mode of thinking, a mood or frame of mind, a way of acting, thinking or feeling". "Attitude", therefore, can be considered as a conscious mood or trend of thought, or it can also be something that we are totally unaware of in our daily lives.

What are some of these attitudes that are so often responsible, or partially responsible, for the "Unsafe Act: that cause the majority of our industrial accidents? Some would be:

Impatience
Impulsiveness
Imprudence
Incredulous
Indifference

All of these, and many more, are often found to be the underlying reasons behind the "Unsafe Act" that caused an accident.

Attitudes like these mentioned probably took years, many years, to develop. Rarely are we aware that we have them. Many have grown from early years as a result of habits we formed at that time and, being habits, we carried them on to a point where they are now part of our character.

How do these attitudes contribute to accidents? Let's look at some of those that have been named:

Impatience; here is the man who wants (often in all sincerity) to get on with the job. Nothing lazy about this fellow, he takes pride in doing a job quickly, so much so he will cut corners safety-wise to achieve it. He is the man who will oil or adjust a machine without shutting it off, or tries to repair that break in the pipe without taking time to shore the trench. He is in a hurry, a hard working impatient man as long as he lives.

Impulsive; to do things on the impulse of the moment without conscious thought of possible consequence. An example here would be the man who will try to prevent the fall of a heavy object when he should simply let it drop, or will put his hand into a moving machine to straighten material. He knows and fully understands that these acts are dangerous but he does these things without thinking and generally to his great sorrow.

Imprudence; here we have the person who knows better but rashly forsakes the safety rules and deliberately gambles on avoiding the consequences. This is the man who drives a forklift truck too fast in a crowded warehouse without consideration of others who are apt to come around corners, or out into the main aisles. He knows something is wrong with the brakes but doesn't bother to get them fixed or report them to the foreman.

It would take far too long to go through all of these attitudes However, special mention should be made of the attitude of the "Incredulous", the people, including the majority of us, who feel that "It can't happen to me." There isn't anything wrong with this if we conscientiously follow the safe rules and procedures because what we mean is "It can't happen to me -- if I can help it".

Unfortunely, there are some who feel it will not happen to them and do not follow the safety rules. They say (and truly believe it to be true) "I've been doing it this way for years and nothing happened and it won't happen now". Why do people think this way? They know accidents happen to other people but they firmly believe they can't happen to them.

Each of us to some degree is equipped with a denial mechanism that overcomes fear. "It can't happen to me, I won't accept it" is the subconscious reaction. "It happens to others because they are not as strong (or as quick) as I am". People often rationalize a deficiency as strength, such is the capability of the human mind to deceive itself. We never see ourselves as others see us.

Attitudes and accidents generally go together, some people have attitudes that are temporary and often due to domestic troubles, worry, health, etc. Unfortunately, some have a rash of accidents and are in danger of being tagged as accident repeaters.

It cannot be denied that there are some people who can not walk down the stairs without falling, who fall off chairs or ladders, and bump other cars and light poles when they drive. But the proportion of these are so few as to be unimportant in safety work.

Just as there are not two clear and distinct types of people in terms of height, the short and the tall, but rather a continuous distribution of people from the pygmies to the giants, so there are NOT two types of workmen, the accident free and the accident makers, but rather a continuous distribution of workmen from those who have no accidents at all to those who have many accidents.

We should bear in mind that the term "accident repeater" is often a convenient form of camouflage for inadequate training, inadequate supervision, or the introduction of a workman to one job, or several jobs in turn, without making sure that he can perform any of them correctly.

The employee who has many more accidents than others doing the same type of work is usually working the wrong way.

There are reasons for people having accidents, and in the majority of cases they can be attributed to:

a) Unsafe work habits
b) Job incompatibility
c) Work environment
d) Physical disabilities
e) Mental awareness
f) Incorrect attitudes

HABITS

It is reputed that the Duke of Wellington once said "Is habit a second nature? No! Habit is ten times nature!!" We live our lives according to our habit patterns and habits, once obtained, are hare to change; anyone who smokes knows this. Habits are most easily learned when we are young, after the age of 30 we have some difficulty in learning new habits, if we have already developed a particular pattern.

Habit diminishes the conscious attention used in the performance of work. On being given a new work situation, we will develop work habits to suit that particular job; although we may not necessarily establish safe work habits on our own. Adoption of habits is natural because habit simplifies the movements required to achieve a given result and it makes them more accurate and reduces fatigue. That is, we subconsciously do the right thing at the right time involuntarily. (We may also do the wrong thing if it becomes a habit).

Driving a car, we generally do it automatically, don't we? We see a stop light or stop sign and we stop without giving any conscious thought to our action, it is habit.

Habits usually follow a sequence. For example, if you take your watch off for any reason during the day, how often have you found yourself automatically winding it up? Because, you have probably established the habit of doing this at bedtime when you take it off.

If we are not given proper job training, including all the safe job methods and procedures to develop safe job habits, we will develop our own habits and procedures; and, because of lack of familiarity with all the hazards, we may develop unsafe habits too without realizing it.

In many cases we find "job training" consists of putting the new man with an old hand to show him how to do the job. As a rule, the new man will learn the job habits from him and do it exactly the same way. Perhaps the experienced worker is not blessed with good work habits, then the new man won't have them either. Even if the old employee is a safe worker, it does not necessarily follow that he is a good teacher or supervisor, and unsafe habits can begin right there and then.

JOB INCOMPATIBILITY

This is a problem of improper selection and placement of the workman, such as:

a) Placing a man in a job that is above his physical or mental capabilities, or
b) Putting a man on a job where there is no challenge, he will be bored, depressed, distracted and antagonistic.

Job incompatibility is a serious problem and is far more prevalent than most people realize. Sometimes it is caused by the man not being able to fit in with the group or the supervisor. If these problems are not recognized and action taken to rectify them you can be sure there will be accidents.

WORK ENVIRONMENT

These are managerial problems and their direct responsibility. They do create accident potential. Some examples are:

- a) Poor housekeeping
- b) Unsafe lighting
- c) Crowding of machines and storage areas
- d) Failure to maintain equipment and machines in safe working order
- e) Failure to provide guards that are properly maintained and kept in place at all times
- f) Permitting the use of unsafe equipment, such as damaged ladders, stairs, tools, etc.

While such problems exist in a plant or workplace, it is self-evident that unsafe habits will continue, new ones will develop and unsafe attitudes will exist because the physical evidence surrounding the employee indicates acceptance of unsafe procedures on the part of management.

PHYSICAL DISABILITIES

This does not mean those people who are lame, blind, or deaf, etc., because these are obvious and most people take them into consideration. Generally speaking those who have disabilities like these are usually very safe workers. The type of disabilities that cause most of the problems are less obvious.

These are: Hearing deficiency, color blindness, subnormal vision, and health probelms. The best answer is pre-employment medical for new employees and regular check-ups for others.

MENTAL AWARENESS

Here we are not concerned about the neurotic or mentally deficient as these are obvious problems. We are concerned about the man who lacks the mental capacity to do a dangerous or complex job as well as the average. Any job where it is essential to think quickly. make rapid decisions and have good reflexes, should be carefully studied and the employee carefully selected for the protection of all concerned.

MANAGERIAL ATTITUDES

There is also such a thing as a "Managerial Attitude", where accidents are attributed to "carelessness, negligence, stupidity, thoughtlessness, etc." Management is very interested in efficient production. However, the attitude that accidents are inevitable in production cannot be allowed to prevail. Greater efficiency can be realized by a sincere interest in a lowering accident rate. This interest should be manifested by a management attitude of intolerance towards accidents.

PREVENTION

How can we best overcome these attitudes in their present form and change them to "safe work attitudes?" Shock methods will not do it, the blood films, posters and actual pictures of accidents. They may get our attention but only for a moment. They frighten us so much that we completely disassociate ourselves from believing that this can happen to us. Our denial mechanism will erect a barrier and prevent the message from getting through. We tend to see accidents as they relate directly to ourselves, as an infrequent event of a minor nature, or perhaps not at all.

Have you ever heard of a man who was told he was going to die of some disease and who believed it? We all know that we were given a death sentence on the day we were born, as we must all die sometime, but do we worry about it? No, of course we don't! Our denial mechanism won't permit it. Shock treatment in accident prevention will not provide the answer unless we are the victim.

We spend too much time talking about past accidents to workmen instead of teaching error free performance of the job to be done. If the New York Yankees wanted to produce better hitters they would hire Bruce Robinson to teach them how to hit, and hit hard. They wouldn't hire a bushleaguer who couldn't bat, as an example of how it shouldn't be done.

Our answer then, lies in a safety program intended to incorporate safety into our work procedures and methods but not the hit and miss type of safety program that is here today and gone tomorrow. Individuals do not inherit attitudes in the same way that we inherit the color of our eyes. We get attitudes from our environment, and for that reason, they can be changed. In this respect, one of the best ways to develop and promote safe attitudes is to set a good example.

Another answer lies in training the worker into safe work habits. This is not always easy to do because we, subject to habit, will find the new way difficult. Instead of reflex action, we must, in the beginning, think of how we are to work while habit will try to force us back to the old way. Have you ever taken a piece of paper and creased it carefully and firmly and then tried to flatten it out again only to find it goes back into the creases you put in it? So it is with habit, but with constant repetition we create new habits which in turn are not easily broken. When it becomes automatic it is habit, a subconscious reflex.

In learning new habits we must never let an exception take place until after the new habit is firmly ingrained in the trainee. The trainee must thoroughly understand why it is so essential that each step be followed in meticulous sequence.

The great thing then in all training and educational programs is to make our nervous system our ally instead of our enemy. Safe habits will protect us from unsafe tendencies if we develop the subconscious safety habits.

Knowing the reasons for the training, and the belief in the continuing safety program being sincerely humanitarian, the negative undesirable attitudes of the employee will give way to the desired positive safety attitude. Such a program may take time and no little effort, but it will ensure the worker's safety, -- an item with no price tag.

N.L.C. - B.N.C.
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